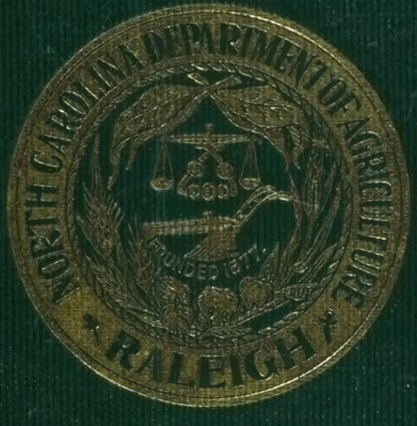
REPORT
COMMISSIONER OF AGRICULTURE



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BIENNIAL REPORT

OF

SAMUEL L. PATTERSON,

COMMISSIONER OF AGRICULTURE,

RALEIGH, N. C., JANUARY 4, 1905.

RALEIGH:
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LETTER OF TRANSMITTAL.

His Excellency, CHARLES B. AYCOCK, *Governor.*

SIR:—I herewith present my biennial report of the work of the Department of Agriculture, and respectfully request that you have it transmitted to the General Assembly.

Very respectfully,

S. L. PATTERSON,
Commissioner.

Raleigh, N. C., January 4, 1905.

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REPORT OF THE COMMISSIONER OF AGRICULTURE.

His Excellency, CHARLES B. AYCOCK, *Governor.*

SIR:—The Constitution of North Carolina provides: Article 3, section 17, that "The General Assembly shall establish a Department of Agriculture, Immigration and Statistics, under such regulations as may best promote the agricultural interests of the State, and shall enact laws for the adequate protection and encouragement of sheep husbandry"—(Amended Constitution, 1875).

In obedience to this requirement the Legislature first succeeding, in 1877, in the beginning of Governor Vance's administration, established the Department of Agriculture, placing it under control and supervision of a Board comprised of the Governor, who was *ex officio* chairman, the State Geologist, the Master of the State Grange Patrons of Husbandry, the President of the State Agricultural Society, the President of the Agricultural College of the State, then a department of the University, and two agriculturists (appointed by the Board, so as to keep the representation of the different sections of the State as nearly equal as might be).

The first meeting of the Board for the organization of the Department of Agriculture was held in the Governor's office, March 21, 1877. There were present

Gov. Z. B. Vance, Chairman.

Prof. W. C. Kerr, State Geologist.

Hon. S. B. Alexander, President State Grange.

Hon. T. M. Holt, President State Agricultural Society.

Hon. K. P. Battle, President of the University.

At this meeting Messrs. I. R. Thigpen, of Edgecombe, and Jonathan Evans, of Cumberland, were elected the farmer members called for in the law.

Professor Kerr was temporary Secretary. On the 29th of March the Board elected Col. L. L. Polk, of Anson, Commissioner, and Dr. A. R. Ledoux, then at the State University, State Chemist. The salary of each was fixed at $2,000. On April 11th Capt. T. J. Roberson, of Fayetteville, was elected Secretary.

Captain Roberson died in office in November, 1879, and on January 20, 1880, Governor Jarvis in the chair, Mr. Peter M. Wilson was elected Secretary and placed in charge also of the State immigration work. Colonel Polk resigned as Commissioner in July, 1880, and Capt. S. B. Alexander, of Mecklenburg, was elected his successor, but declined.

In October of the same year Dr. C. W. Dabney, of Virginia, now the distinguished President of the University of Cincinnati, was elected State Chemist and Director of the Experiment Station, and the Hon. Montford McGehee, of Person, was elected Commissioner. He in turn was followed by others, whose names are elsewhere given.

The Geological Survey, Department of Agriculture and Experiment Station have always been so closely allied, perhaps a few notes of their earlier history and struggles may not be uninteresting.

The prime mover in the establishment of the State Experiment Station, from which afterwards sprung the Department, was Dr. Kemp P. Battle, than whom North Carolina has had no more useful and patriotic citizen. At that time Dr. Battle was President of the University, which controlled the land grant fund, amounting to $7,500 per annum, and the Agricultural College was a part of the University.

This was before the Hatch Act was passed by Congress. About the year 1875 Dr. Battle visited other States and colleges, and was so pleased with the Station in Connecticut, he began at once to arouse public opinion at home to the advantages of such an institution. In this work he was materially aided by the Grange, or Patrons of Husbandry, a use-

ful farmers' organization existing at that day. Dr. W. C. Kerr, another eminent and most useful citizen, was State Geologist. Joining forces with Dr. Battle and the Grange, the Department of Agriculture was established, and connected therewith were the State Geologist and Museum (a small affair then), located in Raleigh, and the Agricultural Experiment and Fertilizer Control Station located at Chapel Hill.

For some years previous the State Geologist had been conducting the Geological Survey, Volume I of which was issued by Professor Kerr in 1875. Dr. Emmons immediately preceded Professor Kerr.

The laboratory and offices of the Survey and the Museum were located near the corner of Fayetteville and Morgan streets, in bare, cramped quarters, entered by outside wooden stairsteps, the principal feature of the Museum being a huge map of North Carolina that covered a whole side of the long hall, probably painted by Mrs. C. P. Spencer. Subsequently the Museum and office were moved to the second story of the Briggs Building on Fayetteville street.

The Station remained at Chapel Hill until 1881, when the Board of Agriculture, under the advice and influence of Governor Jarvis, chairman of the Board, decided to bring together all divisions of the Department, and for that purpose bought the old National Hotel property for $13,000, a most fortunate purchase. The old building has been greatly enlarged, and remains still the home of the Department.

Among some of the notably useful and profitable enterprises of the Department were its exhibits and illustrations of the State's resources at the great expositions. The first exhibit made was through the energy and instrumentality of Professor Kerr at the great World's Fair at Vienna, about the year 1873. This was followed by exhibits of the Department at great fairs at home, Atlanta in 1881, Boston in 1883, New Orleans in 1884, Chicago in 1893, Paris in 1900, Charleston in 1901, St. Louis in 1904. These exhibits have

not only had the effect of attracting attention and capital to such rich natural resources as our forests and minerals, but, aided by the publications of the Department, have provoked inquiries and investigation on the part of outsiders, and have presented the State in altogether a new light to the eyes of the world, and, perhaps, what is better, to our own people also.

Various changes in the composition of the Board of Agriculture and in the methods of appointing or electing its members have taken place. At present the Board consists of eleven members, one from each of the ten Congressional Districts, appointed by the Governor and confirmed by the Senate for terms of six years, and of the Commissioner of Agriculture, who is, *ex officio,* chairman of the Board.

The terms of the members of the Board are so arranged that for each of two biennial periods three appointments are made, and for the third biennial period four appointments are made.

In this order, therefore, at least six members hold over. The terms of the members begin March 9th. The vacancies next occurring on that date, to which his Excellency the Governor will make appointments, are for the Third, Sixth and Ninth Congressional Districts, now represented respectively by Messrs. William Dunn and A. T. McCallum; and, until his resignation to become a member of the Legislature, W. A. Graham.

The Commissioner of Agriculture, who is the chief executive officer of the Department, was elected by the Board of Agriculture from the beginning up to 1899, when the Legislature of that year, in order to bring the Department in closer touch with the people, especially the farmers, of the State, so changed the law as to require the election of the Commissioner to be made in general election with other State officers for a term of four years, the Legislature itself elect-

ing for a short term, beginning June 14, 1899, until after the general election of 1900.

The Commissioners in the order of their terms have been:

L. L. Polk of Anson County, elected March 29, 1877.

Montford McGehee of Caswell County, elected October 20, 1880.

John Robinson of Anson County, elected April, 1887.

T. K. Bruner, acting, elected February, 1895.

S. L. Patterson of Caldwell County, elected June, 1895.

J. M. Mewborn of Lenoir County, elected June, 1897.

J. R. Smith of Wayne County, elected January, 1898.

S. L. Patterson of Caldwell County, elected June, 1899.

The Secretaries have been:

T. J. Robinson (died in office), April, 1877.

P. M. Wilson of Wake County, January, 1880.

T. K. Bruner of Rowan County, December, 1886.

J. L. Ramsey of Wake County, June, 1897.

T. K. Bruner (Rowan) of Wake County, June, 1899.

The State Chemists have been:

A. R. Ledoux, March, 1877.

C. W. Dabney, October, 1880.

H. B. Battle, October, 1887.

W. A. Withers, acting, 1897.

A. W. Blair, 1897.

B. W. Kilgore, June, 1899.

Originally, and for most of the time subsequent, the State Chemist has been also Director of the Experiment Station.

The wise men who originated and developed the plan of establishing a Department devoted to the betterment of the agriculture of the State and to the general advancement of the State's interests, and the Legislature which enacted it into law, looking forward to the future, manifested a broad comprehension of the State's needs. Surely they builded wiser than they knew. It is remarkable that during all the changes of the years nearly all of the essential features of

the original law, and couched in almost identical language, are still retained, with such modifications only and additions as have become necessary from experience or changed conditions.

Among the duties originally imposed on the Department, and still retained, somewhat amplified, are the following:

The Commissioner of Agriculture (formerly the Board), by and with the consent and advice of the Board, shall investigate and promote such subjects relating to the improvement of agriculture, the beneficial use of commercial fertilizers and composts, and for the inducement of immigration and capital, as he may think proper; but he is especially charged with investigations adapted to promote the improvement of milk and beef cattle, and, especially, investigations relating to the diseases of cattle and other domestic animals, and shall publish and distribute from time to time information relative to any contagious diseases of stock, and suggest remedies therefor, and shall have power in such cases to quarantine the infected animals, and to regulate the transportation of stock in this State, or from one section of it to another; and may co-operate with the United States Department of Agriculture in establishing and maintaining cattle districts, or quarantine lines, to prevent the infection of cattle from Splenic or Spanish fever. Any person willfully violating such regulations shall be guilty of a misdemeanor. (Liable also in a civil action).

With investigations relative to the ravages of insects and with the dissemination of such information as may be deemed essential for their abatement, and shall make regulations for the destruction of such insects (violation of which is a misdemeanor).

With investigations and experiments directed to the introduction and fostering of new agricultural industries, adapted to the various climates and soils of the State, especially the culture of truck market gardens, the grape and other fruits.

With the investigation of the subject of drainage and irrigation, and shall publish information as to the best methods of both, and what surfaces, soils and locations may be most benefited by such improvements; also, with the collection and publication of information in regard to localities, character, accessibility, costs and modes of utilization of native mineral and domestic sources of fertilizer, including formulæ for composting, adapted to the different crops, soils and materials.

With the collection of statistics relating to the subject of farm fences, with suggestions for diminishing their cost, and the conditions under which they may be dispensed with altogether.

With supervision of all measures for the propagation and culture of fish in the rivers and inland waters of the State (provides also for accepting such aid as the United States Fish Commission may be induced to extend, and to encourage said Commission to establish a fish hatchery in the State)—provides also for inquiring into the practicability of construction of fish-ways over the dams and other obstructions in the rivers of the State, so as to secure the free passage of fish.

The Commissioner of Agriculture (formerly the Board), shall transmit to the General Assembly at each session, a report of the operations of said Department, together with suggestions of such legislation as may be needful.

With the enforcement and supervision of the laws which are, or may be, enacted in this State for the sale of commercial fertilizers, seeds and food products, and with authority to make regulations concerning the same. (The willful violation of such shall be a misdemeanor).

The act provided also for co-operation between the Geological Survey and the Department of Agriculture in maintaining the Geological Museum already begun, and for enlarging its scope and increasing its collections.

Among the duties originally enjoined upon the Board, but which, in the passing years, have dropped out, were the collection of crop statistics, and investigations which seemed best adapted to promote the extension and improvement of sheep husbandry, and with the collection and publishing of statistics on the subject, and suggestions to the Legislature of measures for the encouragement of this industry, and more particularly for the suppression of the ravages of dogs. While this provision has been omitted from the duties enjoined on the Department of Agriculture it remains in imperative force and effect in the Constitution of North Carolina.

Let me dispose of this subject here and now by calling the attention of the Legislature to the constantly decreasing interest in sheep husbandry, the decrease between the census of 1890 and 1900 alone being 25 per cent. At the rate of decrease still going on in sheep husbandry, one of the most needful branches of animal industry for North Carolina, will soon be wiped out of existence.

But the *Constitution* says emphatically that the General Assembly *"Shall* enact laws for the adequate protection and encouragement of sheep husbandry."

My recommendation of the first needful step to comply with this requirement of the Constitution is to place a substantial tax on all female dogs, and to authorize the killing by any one of all other dogs caught in the act of chasing sheep.

In my judgment a few years would mark a much-to-be desired decline in the canine and a corresponding increase in the sheep industry. It would be time then to consider other measures "for the adequate protection and encouragement of sheep husbandry."

I shall later on in this report refer again to the collection of crop statistics.

In addition to the foregoing provisions, enacted by the Legislature of 1877, certain rules and regulations were also established for the control of the fertilizer traffic in the State, then in its infancy, and so wisely drawn that most of them remain to the present time.

1879.

Some immaterial changes in and additions to the laws were made by the Legislature of 1879, such as authorizing the State Geologist to deliver at the University a course of free lectures on the geology and mineralogy of the State; and authorizing the Board of Agriculture to "pay the rent and other necessary expenses of the Geological Museum." Instead, however, of a continuous payment of rent in cramped and unattractive quarters unsuited for the Department, and unsuited for the Museum, acting under the advice of our great statesman, whom North Carolina is so justly proud of, then Governor Thomas J. Jarvis, the property was purchased, since greatly enlarged, where the Department now has its home. (This was probably in 1881).

The Museum has grown in size, variety and value. No other in the South is comparable with ours, and very few in the United States surpass it. Recently an additional feature of inestimable value has been added to the Museum. The "Hall of History," established through the indefatigable industry and unselfish perseverance of Col. Fred A. Olds, is going to quicken a new interest in our dormant State history and add immensely to its importance.

1881.

An act was passed requesting the Board of Agriculture, through the Commissioner and State Chemist, to report upon the "feasibility of establishing a State guano works or fertilizer manufacturing establishment" for the manufacture

of fertilizers to be supplied to farmers and truckers at prime cost. But this seems to have been considered impracticable and abandoned.

1883.

The membership of the Board was changed by act of the Legislature in 1883, by providing for the election of members, one from each Congressional District, "who shall be so chosen as to secure as nearly as may be a representation of all the leading industries of the State."

A few changes were made also affecting the compensation allowed and time of holding meetings, bequests for special purposes, etc.

1885.

In 1885 the Legislature established the State Board of Health and directed that analyses for the purposes connected with the hygienic duties of the Superintendent of Health shall be made by the Chemist of the Agricultural Station. (Such analyses to include soils, drinking waters, articles of food, etc.)

In this year also appears the dawning idea of an Industrial School, which the Board of Agriculture is authorized and directed to establish, from which has been evolved in successive stages of growth the Agricultural and Mechanical College, which is doing its great and beneficent work for the State. The Industrial School referred to was not established but was afterwards merged into the college provided for by the Legislature of 1887.

A survey of the oyster beds and an examination of the waters of the State with reference to their possibilities for the culture of shell-fish were enjoined upon the Board, and executed under direction of Lieutenant Winslow of the United States Naval Service.

1887.

The Legislature of 1887 made quite a number of changes and additions. Most of the changes are not of especial interest, nor material to the main purpose of this report. The additions are for the most part obligations imposed upon the Board in continuation of the duties enjoined in the original act, and are as follows:

The Board is charged with such investigations as will best promote the improvement and extension of diversified farming, including the general rotation of crops, the raising of home supplies, vegetables, fruits, stock, grasses, etc.

The said Board shall co-operate and aid in the formation of Farmers' Institutes in all the counties of the State, and shall send the Commissioner of Agriculture, the Director of the Experiment Station, the teachers in the Agricultural College, or some other representative from their body, to assist in holding these institutes, at least once in every two years, in every county in the State, in order to instruct the people in improved methods of farming and to ascertain the wants and necessities of the various farming communities.

They shall publish a monthly bulletin, or report of their current work and expenses, which shall not contain any advertisements or any other matter which would injuriously affect the newspapers of the State; but shall contain reports of analyses and other work, of experiments at the Experiment Station and Agricultural and Mechanical College, the dates of meeting and records of Farmers' Institutes and similar societies, reports on farm dwellings and buildings suited to our climate and needs, a list of Agricultural Fairs to be held in the State, reports of experiments and experiences of farmers, and upon such other matters as are named in the law.

They may employ a Geologist, Surveyor or Engineer for such specific work as may be necessary in the performance of their duty under this law.

They shall keep a Museum, or collection, to illustrate the agricultural and other resources and the natural history of the State.

This session of the General Assembly enacted, "That the Industrial School provided for in chapter 308, Laws of 1885, shall be denominated 'The North Carolina College of Agriculture and Mechanic Arts.'" Provision was made for building, equipping, conducting and managing the College. The Board of Trustees was composed of the Board of Agriculture and five other persons to be appointed by the Governor.

The Directors of the Penitentiary were required to furnish, free of charge, the brick and stone necessary for the buildings, and labor in clearing up the grounds, digging foundations, etc. The Board of Agriculture was directed to aid in the buildings with a portion of its funds.

The relation between the Department of Agriculture and the College has undergone various changes, but has revolved until now it has nearly reached its starting point. At another part of this report the College will be referred to. I am endeavoring now to trace what may be termed the statutory history of the Department.

1889.

No legislation was enacted affecting the operations of the Department, excepting that the Governor, who had been up to this time *ex officio* chairman of the Board, was relieved of that duty, and the Board afterwards elected its own chairman.

From the beginning and up to this time the revenue of the Department had been derived from licenses imposed upon the sales of commercial fertilizers; "for which shall be paid a privilege tax of five hundred dollars per annum for each separate brand or quality."

The constitutionality of this privilege, or brand tax, was contested by the fertilizer companies and declared by the United States Supreme Court to be unconstitutional. This

decision of the Court left the Department in some straits. Either its valuable work must be abandoned and the trade in fertilizers become utterly demoralized, or some other method of collecting a protecting tax be devised.

The Legislature of 1891 adopted the tonnage system, imposing a tax of twenty-five cents on every ton of fertilizer sold within the State. The constitutionality of this tax was also tested in the Supreme Court, but was sustained on the ground of its being a State police regulation.

In March, 1887, what is known as the "Hatch Act" was passed by Congress, carrying with it an annual appropriation to all the States of fifteen thousand dollars for scientific and experimental purposes. The act went into effect in 1888.

The Act of the Legislature of 1877 provided for the establishment of an Experiment Station for the analysis of soils, marls, fertilizers, etc., and for conducting experiments upon the growth and nutrition of plants, to ascertain what fertilizers were best suited to the various crops of the State, and what other crops may be grown to advantage.

It will be of interest to note that the State Experiment Station was the second Station established in the United States, that of Connecticut alone preceding it. This Station was, after the passage of the "Hatch Act," consolidated with the United States Experiment Station provided for in that act, and the Experiment Station was made a department of the college and placed under the management of the Board of Trustees.

The adoption of the "tonnage" tax in place of the "brand" tax necessitated some corresponding changes in the fertilizer laws by the Legislature of 1891.

The same Legislature abolished the Bureau of Immigration and the duties of the Commissioner of Immigration were imposed on the Commissioner of Agriculture, who afterwards was known as the Commissioner of Agriculture and

Immigration, and the Commissioner of Agriculture was allowed for said additional service one hundred and fifty dollars per annum, to be paid out of the State Treasury. The operation of the Bureau had not been successful.

At this session the State Geological Survey was established, "which Survey shall have as its object the thorough examination of the nature and extent of the mineral and timber resources of the State."

1893.

No changes of the laws governing the Department of Agriculture were made at the session of 1893. "For the support, maintenance and extension of the College" ten thousand dollars out of the State Treasury was appropriated.

1895.

In 1895 a different political party was in control of the Legislature, which endeavored to plow deep furrows through the organizations of both Department and College. They proved to be, however, untrained hands, their work being quickly healed over by the Supreme Court, no change remaining except an increase in the membership of the Board, and certain appropriations for additional buildings at the College and for equipment.

But in 1897 a complete change of control and management was effected, and new men conducted Department and College affairs, the governing Board being separated and made two and increased in numbers.

The Legislature of 1899 found it necessary to adopt somewhat unusual and heroic measures. In order to secure control of the Department the membership was largely increased and all new members were elected by the Legislature. Provision was also made for a gradual reduction of members to the number existing at this present, that is, one from each

Congressional District, to which has been added the Commissioner of Agriculture *ex officio.*

It was further made the duty of the Board to "proceed to reorganize the said Department in the interest of the taxpayers of the State to the extent allowed by law."

1901.

The office of Commissioner having been raised to the dignity of a State office, and filled by direct vote of the people, the Legislature of 1901 increased correspondingly his duties and responsibilities, laying upon him the burden of directing the affairs of the Department by and with the advice and consent of the Board of Agriculture. He was made a member of the Board and, *ex officio,* its chairman.

The A. & M. College was once more placed in charge of the Board of Agriculture, a Board of Visitors being provided to give counsel and make suggestions to the Board of Agriculture, acting as Board of Trustees. An act was passed making farmers only eligible to membership.

The study of agriculture had languished and the obligation devolved upon the Board of Agriculture to revive it. They found less than a score of boys taking the Agricultural course. The Chair of Agriculture had been declared vacant. Their first step was to secure the services of an experienced, attractive and practical professor. The man for the place was found in Prof. C. W. Burkett; a man, broad-minded, magnetic, enthusiastic, and thoroughly in earnest. The School of Agriculture now numbers 102 students, and this number does not include the special students taking the "short course" of ten weeks during the winter months.

The College has grown from 265 students in 1901 to 427 in 1904. This is the full number the College can accommodate. There is pressing need for more dormitory room.

In the fall of 1901 the principal dormitory building was burned. This building contained also the kitchen and dining-

room. An emergency was upon the Board, in meeting which they acted as wisdom prompted: built a larger building on the site of the burned building, devoted wholly to dormitory rooms, and began the erecting of another building, containing dining-hall in basement, with kitchen attached, lecture rooms and library on first floor, and auditorium on second floor, all of which were of commanding importance.

Insurance money on the burned building and other money, borrowed with the advice and consent of the Governor and his Council of State, were used for meeting the expenses of the work as far as it had progressed. Watauga Hall was practically complete, but the new "Pullen" Building had advanced but little beyond the bare brick walls and roofing.

This was the condition which confronted the Legislature of 1903.

I have begun to introduce into my report these College affairs, because of the close relationship, under one management, of the College and Department. And I have given this sketch of history concerning the Department with two objects in mind. First to show to the Legislature how nearly the Department of Agriculture in its successive stages of development has endeavored to track the requirements imposed upon the Board by successive Legislatures, and to declare to the Legislature that the work of the Department, as now conducted, is useful and necessary to the State, and cannot be abandoned without serious loss. The Department is now more nearly fulfilling all its obligations than has ever before in its history been possible. And secondly, to show also that all work undertaken by the Department, not explicitly set forth in the laws, such as its co-operative work with the State Board of Health, analysis of water and soils, its connection with the geological work and soil survey, its exhibits at international fairs and the like—all these useful undertakings are so much akin to the general purposes and

objects laid out for the Department as to be more than warranted in their performance.

The Board of Agriculture, composed of practical, sensible and honest men, aided by wise legal counsel, are doing their duty as required by law. They are not extravagant or wasteful of the funds of the Department, and I respectfully ask the Legislature to allow them continued latitude in their work.

Definite and valuable results have already been gained from the Test Farms, and other farms should be established in sections of different soils and products.

All the transmontane counties and several east of the Blue Ridge have been cleared of the deadly and destructive cattle tick, under direction of our expert Veterinarian, Dr. Butler. This work is now progressing eastward and in a few years will cover practically the entire State, adding incalculably to the value of our cattle industry.

Dr. Butler has answered many calls from all sections of the State for treatment of sick cattle, horses and hogs. His lectures at the Farmers' Institutes on the care, feeding and breeding of farm stock, and the information given to farmers are of great practical value. Outside of the work above named the animal industry of the State is entirely too important and valuable not to have a competent veterinarian who may be consulted in cases of serious outbreaks of disease and epidemics. According to the census of 1890 the loss of hogs alone was 25 per cent. of the whole number, most of which doubtless died from hog cholera. At that time farmers knew comparatively little of the disease. Since then veterinary science has come to their aid, mostly by way of preventive measures, and for years past losses have been at a minimum.

Mr. Sherman, Entomologist, has sent out many thousands of letters and circulars relative to dangerous insect pests, and as to the best known methods of treating and destroying them.

While there can be no certain way of measuring results, his services must prove of great value and importance to all the fruits and market gardening crops.

In view of the rapidly enlarging area devoted to the trucking industry and of the large investments being made in that important field, an experienced Horticulturist has been secured, who, while caring for horticultural interests throughout the entire State, will devote especial attention to trucking in the east.

The Board of Agriculture contemplates the establishing of a Test Station at an early day, if funds are available, at some convenient point in the trucking region, in order that tests of soil, truck crops and fertilizers may be made under the intelligent superintendence of Mr. Hume, the Horticulturist.

The work of Mr. McCarthy, the Botanist and Bacteriologist of the Department, is constantly increasing. Many demands for information come to him from all over the State on many subjects. His most important work is probably in the detection of disease germs in waters, sputa and blood.

For fuller and detailed information concerning the duties of the various officers in charge of the different divisions of the Department of Agriculture, and for the results and progress of their work, I beg to refer to their reports herewith submitted, and made a part of this report, viz.:

B. W. Kilgore, Chemist.

Gerald McCarthy, Bacteriologist.

Dr. Tait Butler, Veterinarian.

Franklin Sherman, Jr., Entomologist.

H. Harold Hume, Horticulturist.

H. H. Brimley, Curator of Museum.

I can say truthfully of these men that all have been capable, industrious and faithful in the performance of their respective duties. I deem the Department especially fortunate in having such a corps of intelligent and useful workers.

Farmers' Institutes.

I have already referred to provision by the Legislature of 1887 for holding Farmers' Institutes in all the counties of the State. For years this work was more or less hampered for lack of force on the part of the Department, and for lack of interest on the part of the farmers. It is very gratifying to be able to say now that since the Department has increased its regular force the institute system has been organized more fully and a corresponding interest among the farmers is manifested. The institutes are perhaps the chief point of contact between the Department and the farmers, and the beneficial results are self-evident. Dr. Butler has been mainly in charge of this work for the year past, and his report deals more fully with its details.

The Bulletin.

The circulation of the monthly Bulletin grows apace. When this writer first came to the Department less than 5,000 copies were distributed. The mailing list now contains some 27,000 names to whom The Bulletin is sent every month. The Bulletin gives life to the Department work; without it the results obtained from analyses of all sorts and experiments would be of little value, and information sought by farmers on many subjects could scarcely be given. Its publication is a necessity, but costly. The paper, printing, pictures and postage of 27,000 copies sent out each month amount to a large yearly sum, which is shown in the financial statement elsewhere in this report. When The Bulletin was established its cost was limited to $50 per month. This sum hardly pays postage on The Bulletin issue of to-day.

It may be asked what evidence can be presented to show that the efforts put forth by the Department have borne fruit commensurate with its expenditures. While I may not answer such an inquiry adequately, I can point with certainty

to the thousands of letters annually sent in answer to letters of farmers and others, asking for information on all sorts of subjects, to the wide-awake interest in the results gathered at the Test Farms, to the requests from other sections of the State for the establishment of such farms, to the more intelligent use of fertilizers, to the raising of home supplies, to the conspicuously evident improvement in farm methods, to renewed interest in farming. I might justly claim for the Department a share at least in the greater prosperity of farmers all over the State. I might refer to the current and generally accepted saying that North Carolina is far ahead of Virginia, where no Department of Agriculture has existed until in very recent years; and in South Carolina, where the so-called department has been swallowed up by the Clemson A. & M. College. But to one who will come and acquaint himself with the work done, it will not be necessary to refer to any of these things.

State Exhibit at St. Louis.

By joint resolution of the last Legislature an appropriation of $10,000 was made of funds in the Treasury, available only under certain prescribed conditions, for providing an exhibit of the State's resources at the great St. Louis Exposition, now just closed, the exhibit to be made under the direction of the Governor and his Council of State. The Governor and his Council called into service the Department of Agriculture for making the exhibit, both on account of the use of the Museum, from which the exhibit would be largely drawn, and for the services of the experienced men connected with the Department.

The appropriation was not available, however, until an equal amount had been raised and placed in the Treasury by private subscription. This became a difficult and disagreeable task, and without the personal appeals made by the Governor to the people the subscription could not have

been secured. As it was, the Department of Agriculture had to subscribe several hundred dollars ($708.11) at the last to make up the amount necessary to secure the full $10,000 State appropriation, and it is yet doubtful whether there may not be a deficit before all the exhibit is reinstalled in the Museum, from which most of it was taken.

To make a creditable display of the State's vast resources with $20,000, side by side with other States whose appropriations ran from $50,000 and up, was no light task.

The installing of our different resources was comparatively very modest, but I have good reason for saying that when the awards of true merit are made North Carolina will be, as usual, well to the front in every line in which her exhibit competed.

The State was extremely fortunate in having such a manager as Mr. H. H. Brimley and such able and expert officials connected with the Exposition as Professor Holmes and Mr. Bruner.

A committee of the Board visited the Fair and made an examination of all accounts to the date of their visit. Later the committee will report fully.

The Department is named in the Constitution "Department of Agriculture, Immigration and Statistics." No kind of statistics is particularized, but the Legislature of 1877 provided for taking crop statistics, under direction of the Board of Agriculture, by the tax-listers of each township. The system provided was cumbrous, unsatisfactory and unnecessary in tedious detail. It accomplished no practical result, and was repealed by the next Legislature. A like effort was made in 1889 with a like result in 1891. Correct statistics of leading crops would be valuable. I earnestly recommend to the Legislature the passage of a law requiring a report of every farmer to the tax-lister of the acreage of his leading crops of the year preceding, and the yield of each, and of present acreage. I would confine the reports to such crops

only as cotton, corn, tobacco, wheat and peanuts. I do not see why such a system should provoke opposition, for the infinite details of the former laws would be eliminated, and the results would prove a reliable basis for computing by comparison the results of growing crops, which would be of great service. Frequent requests are made of the Department in the interests of farmers for estimates of crop yields.

As it is, I have only crude methods for making estimates, which are at best unsatisfactory.

I think it will require no argument to convince the intelligence of the Legislature that reliable crop statistics would be of great value.

Other statistics are sometimes called for, which can be usually supplied either from publications from this Department or from the Bureau of Labor Statistics or by resort to the Auditor's reports.

Immigration.

I have already stated that the Legislature of 1891 abolished the office of Commissioner of Immigration, which carried with it the Bureau of Immigration, and imposed upon the Commisioner of Agriculture the duties of the Commissioner of Immigration. Evidently the Legislature did not consider the Bureau a paying institution to the State. But this was not for lack of energy, enterprise or fidelity to his work on the part of the very capable gentleman then in charge.

The writer, whose office inherited the labor of the Immigration Bureau and a small part of the compensation, has labored pretty hard with this knotty problem of securing an influx of desirable settlers into North Carolina. Some results have been accomplished, but these are hardly commensurate with the efforts put forth, nor with the opportunities which would open both to the State and to the settlers upon a successful solution. North Carolina has the farm lands to offer, and there are plenty of home-seekers who would do well

with the lands. The problem is to bring them together, and it is a much more difficult one than may at first appear.

Without going here into a discussion of the difficulties, or of the subject generally, I will merely state that I co-operate with the land and industrial agents of the different railroad systems and with real estate agents; I answer many letters giving in detail information of the character of land in different sections of the State, prices, products, etc., and I send out many publications descriptive of the State and its resources.

But while we are waiting for immigrants to come and make our good old State "blossom as the rose," I beg to submit the opinion that it is more to the point, more rational, more practical to aid our own farmers already in the field to the best of our ability by strict attention to the obligations and duties imposed on the Department of Agriculture, making investigations and experiments, fostering new enterprises, seeking to promote the animal industry, to use profitably commercial fertilizers, to seek to promote the extension and improvement of diversified farming, including the rotation of crops, the raising of home supplies, vegetables, fruits, stock, grasses, etc., in other words, to do all those things so wisely set forth in the law from the beginning. Our farmers need and ought to have the results of the experiments made at the Test Farms, these farms ought to be increased in number, and they will increase in efficiency. The farmers need and deserve all the protection that can be thrown around the trade in commercial fertilizers and feed stuffs; they need and deserve to have all the aid this Department can give in every line of their work. There are many who entertain the opinion that our own people, already the most homogeneous in the United States, are capable of intelligence and progress beyond any degree to be obtained in an influx of immigration from elsewhere. At the same time, the honest capitalist who is seeking safe and profitable investments,

and the worthy, industrious settler, whether laborer, mechanic or farmer, wishing to partake of the advantages of our unsurpassed climate and of our natural resources, will alike find an open door and a cordial welcome.

Receipts and Expenditures of the Department.

The receipts for the past five years have been as follows:

For 1900	$55,247.69
For 1901	67,988.24
For 1902	66,142.97
For 1903	80,048.88
For 1904	97,800.19

A statement of the disbursements for the last two fiscal years is appended.

The marked increase in the sale of fertilizer tags indicates a continued purpose of the farmers to rely more and more upon the use of commericial fertilizers for raising their crops. Not only is the territory broadening, but heavier applications are resorted to. During the fiscal year just closed (November 30), there were bought by the farmers of the State something like 450,000 tons of all sorts, involving an expenditure, an investment, as it were, and before the crops were even planted, of the enormous sum of $8,000,000. Surely this is too much, and surely much of this is used injudiciously, ignorantly and wastefully. Herein is the need emphasized of farms to test the value of different kinds of fertilizers to different kinds of crops and on different kinds of soils; of Farmers' Institutes, where competent, experienced men may instruct the farmers upon the use of fertilizers and kindred subjects; of the publication of The Bulletin, to advise the farmers of the chemical values of different brands of fertilizers, and of every agency to aid them in their arduous labors. Herein is a pointer to the meaning of the law which charges

the Department of Agriculture with the collection and publication of information of the cost and modes of utilizing native and domestic sources of fertilizer, including formulas for composting adapted to the different crops and soils; to the rotation of crops, and to soil-improving crops.

Such vast interests as the fertilizer trade involves require the most constant care and closest atention.

The law makes it the duty of the Commissioner to "report to solicitors and to the General Assembly information as to the existence or formation of trusts or combinations in fertilizers or fertilizing materials which are, or may be, offered for sale in this State, whereby the interests of the farmer may be injuriously affected, and shall publish such information in THE BULLETIN of the Department."

Undoubtedly there are several combinations of large fertilizer companies, chief of which is the Virginia-Carolina Chemical Company, which comprise a large number of companies throughout the South, thereby weakening competition. It is a fact also that the price of fertilizers has advanced; but I have not discovered that this advance is any greater than the average advance in prices of all kinds of materials and labor. The companies composing these combinations, with few exceptions, manifest a willingness and purpose to obey our laws and regulations, and, as a rule, have given little trouble in the control of their business in the State. Indeed, it is very gratifying to say that nearly all of the companies do this, and that this great traffic is in satisfactory condition.

INSPECTION OF COTTON-SEED MEAL AND STOCK FEEDS.

For the same reasons that a system of fertilizer inspection was inaugurated, it became necessary to provide against frauds in cotton-seed meal and stock feeds. The former was placed on the "tax list" in 1901 and the latter in 1903.

Not any great difficulty has been experienced in bringing under control the cotton-seed meal trade. The main necessity has consisted in impressing upon manufacturers and dealers the determination of the Department to execute the law.

With the stock feeds the problem has been somewhat different. It is hardly necessary to enumerate all the difficulties encountered in enforcing this law. But when it is considered that the law was a new thing, that these concentrated feeds consist of a great variety of mixtures, that the people have not understood the terms which measure the value of stock food, I think no surprise need be felt that time and patience are necessary to put the law into successful and satisfactory operation. It has already worked beneficent results, for shameful frauds had been practiced upon our brute friends, who had no voice to protest against them. If they had, I am sure they would cry out against their rations being imported from St. Louis, Chicago, Memphis, Texas and intermediate points, and sold in competition with the North Carolina ground and mixed feeds. I shall present a few amendments to the Legislature to strengthen the execution of the law which I respectfully ask to be acted upon favorably.

The Pure Food Law passed in 1899 has continued to work out results affecting the health of the people. Many of the adulterated articles of food, found in every corner grocery and country store, have been driven from the market by the exposure of their unfitness, their numbers showing a steady decrease with each recurring season.

Dr. Kilgore's report will discuss this work of the Department in fuller detail.

Department of Agriculture and A. & M. College.

Ever since the Board of Agriculture took charge of the College in 1901, and the number of agricultural students began

rapidly to increase, the need of an Agricultural Building, designed and arranged especially for the study and illustration of soil analysis, plant growth, veterinary science and practice and the like, has been sorely felt. Two years ago the Board of Agriculture thought it not amiss to ask the Legislature for an appropriation of $50,000 for the erection of such a building, to be paid out of the State Treasury, as other State college appropriations are paid, of which the farmers pay their just proportion in taxes. No other expenditure had been made at the College, especially in the interest of agriculture, except for the erection of a little wooden dairy building, now old and dwarfed by the side of the big buildings surrounding it. The Board presented a memorial to the Legislature setting forth the need of an Agricultural Building, and respectfully asking for the appropriation. The bill came up for action in the closing days of the session, when the overworked and weary members had not time nor patience to consider important new measures, especially such as involve the expenditure of large sums of money, and was defeated. But the Legislature did not stop here. An act was passed requiring the Board to complete the Pullen Building, to purchase twenty-five or thirty lots, containing several dwellings, both as a site for the Agricultural Building and on account of their objectionable proximity to the College, and to erect the Agricultural Building, borrowing the money if need be, but denying to the Board the faith and credit of the State, and the further requirement of the payment by the Board of Agriculture of $10,000 per annum for current expenses, beginning after the first year.

I can see no more reason in using the money derived from the taxes on the farmers' fertilizers to bear the current expenses of the College, which include all departments of the College, than to use it for the support of the University or the department for the dangerous insane. Let us spend it then in such useful channels as are at least akin to agricul-

ture, and to the purpose for which the tax is levied. I ask the Legislature most earnestly to relieve the Board of the payment of this $10,000 to the College's current expenses.

Pullen Hall has been completed. The lots referred to have all been purchased, and all paid for except two, the titles to which are in the names of minor heirs and which are now being adjusted by the courts. These draughts upon the resources of the Department have been a heavy drain and have crippled our operations. They would have been impossible but for the heavy increase in the tax receipts during the past two years.

It was impracticable to begin work on the Agricultural Building as early as contemplated by the Legislature, and to complete the building within two years. It is gratifying to say the work is now well under way, and the building will be a credit to the State. The contract price for the completed building is $41,348. The Board has borrowed $35,000. With this amount, and with such surplus as we may reasonably anticipate from the receipts of tag sales, I believe the work can be done. The building will be devoted to the State's greatest industry, and will, I believe, incite a new interest and greater pride in the noble occupation of agriculture.

Increased Receipts.

It will be observed from the receipts of the Department heretofore given, that they have increased nearly 50 per cent. within the past four years. The conditions under which this increase has occurred have been unusual, and are not likely to be repeated. Indeed we can hardly expect the sales of tax tags to be at all larger during the incoming year than for the year past. The prevailing high prices of farm products have stimulated increased purchasing of fertilizers. The recent disastrous slump in the price of cotton will tend to check both the acreage of this, the most important of all

crops, and will give pause to investment in large quantities of expensive fertilizers.

I trust the Legislature will not consider the abnormal increase of the past four years as a guide to mark the ability of this Department to bear any greater obligations than have been already incurred.

The Highway Commission.

The Legislature of 1901 established a State Highway Commission, naming, as members of the Commission, the State Geologist and Commissioner of Agriculture, and the Secretary of the Board as Secretary of the Commission. It has been impossible for the Commission to carry out the full purpose of the Legislature in its establishment, both for lack of means and lack of time. But the Commission has endeavored to meet and foster the spirit of road improvement that possesses many counties in the State. Hundreds, perhaps thousands, of the "Mecklenburg" road law, of the "Holmes" road law, of the "Old" road law, have been distributed upon application. I have recently compiled the general road legislation existing in the statute books, and have this compilation published in pamphlet form, which may be of some service to the members of the Legislature. The subject of road improvement is full of interest, and is of the highest importance to the material welfare of the people. Many of the counties have special road laws. In my judgment this is to be discouraged. A few general laws, applicable to varying conditions of soil, road material and available funds in the different sections of the State, would be far better. The importance of the subject demands of the Legislature full consideration and wise action.

Conclusion.

In endeavoring to present clearly to the Legislature the work of the Department, its history, its purposes and its obligations, I fear this report is already too long-drawn-out and I hesitate to say more. But I hope it will not be transgressing the proprieties to call attention to the amount of additional labor and responsibility which has been imposed from time to time upon this office. In the nature of things, as now existing, the Commissioner must be held responsible to a large degree for the success or failure of the work in every division—chemical, veterinary, entomological, bacteriological and horticultural. He must direct the Farmers' Institute work, the publication of The Bulletin, the inspection of the fertilizer and feed trade; he must conduct the correspondence and do all necessary things pertaining to immigration and Highway Commission duties. He must give the best information obtainable in answer to many inquiries on many subjects. Besides all these his duties as chairman of the Board of Trustees of the A. & M. College are onerous and exacting. Without such an able corps of assistants and the counsel of a wise and practical Board of Agriculture, the task would be impossible.

I do not desire credit for myself, my associates, or the Board, further than to claim for all a sincere desire to do efficiently the work devolving upon us, and a patriotic purpose to serve the State. I do not claim that mistakes have not been made. Who of us does not see what might have been with clearer vision than what is to be? But, guided by the lamp of experience, growing constantly in knowledge of the things pertaining to our manifold duties, we will go forward with renewed energy, and with the earnest hope of acquiring greater efficiency in their performance.

Without embarrassment, without fear of just censure, but with reasonable confidence of approval, I present the work

of the Department of Agriculture to your Excellency, to the Legislature and to the State.

To your Excellency, whose cordial interest has at all times been manifested in the work of the Department, and whose substantial aid and wise counsel have been freely given in all times of our need, I return my most grateful acknowledgment.

Respectfully submitted,

S. L. PATTERSON,
Commissioner of Agriculture.

January 4, 1905.

REPORT OF STATE CHEMIST.

December 10, 1904.

Mr. S. L. Patterson,

Commissioner of Agriculture.

Dear Sir:—I beg to submit a report of the work of the Chemical Division of the Department for the past two years (December 1, 1902--December 1, 1904).

The report will be considered under the following heads:

1. Analytical Work.
2. Pure Food Work.
3. Concentrated Stock Feeds.
4. Test Farms.

1. Analytical Work.

The amount and kinds of analytical work performed in the laboratory is shown in the following summary of analyses made in that time:

Official Samples of Fertilizers	1,401
Fertilizers and Fertilizer Materials for Farmers	269
Cotton-seed Meal	267
Cotton-seed Cake	1
Health Waters	209
Mineral Waters	152
Rocks, Ores and Minerals identified and values reported	377
Marls	11
Ores (Iron, Gold, Copper)	19
Lime	1
Limestone	2
Oyster Shell Lime	1
Agricultural Lime	1
Shell Lime Rock	1
Boiler Scale	2
Ashes	5
Muck	1
Graphite	1
Coal	3
Rock	1
Stable Manure	1
Linseed Oil	3
Whiskey	17
Beers and Ciders and Wine	40
Bitters	7
Gin	1
Egg Preservatives	2

Quinine Hair Tonic	1
Sachet Powder	1
Pratt's Velvet Preparation	1
Pratt's Tooth Powder	1
Peruna	1
Distillery Slop	1
Flour	152
Meal	24
Feed Meal	1
Molasses	15
Maple Syrup	4
Canned Meats	33
Fresh Meats	12
Canned Fish and Oysters	53
Canned Fruits and Vegetables	60
Prepared Mustards and Dressings	33
Butter	15
Cocoa	14
Chocolate	10
Lard	11
Breakfast Foods	42
Baking Powders	18
Vinegar	64
Sugar	45
Honey	10
Tapioca	3
Catsups	33
Sauces	25
Starch	1
Milk and Butter Purifier	1
Soils	451
Soils tested for acidity	18
Experimental Farm Crop Samples	94
Cotton-seed Kernels	30
Corn Kernels	29
Concentrated Feeds examined both chemically and microscopically	708
Total for the two years	4,811

A comparison of the number of samples analyzed during the two years under consideration shows a large increase over those examined in the two years included in the previous report. In addition to fertilizers, food products and stock feeds, a large amount of miscellaneous work has been done, including fertilizers for farmers, mineral and health waters, ores, marls, rocks, etc. It is not necessary to discuss these in detail, as reports have been submitted in all cases and the results made immediate use of.

The analyses of fertilizers occupy a large portion of the time of the workers in the laboratory, the Division being or-

ganized on the basis of performing, with reasonable promptness, this class of work. All of the analyses, except those made for farmers, have been published in THE BULLETIN during the spring months of the two years and in time for the farmers to know mostly before using the character of the goods they were purchasing or had purchased for use on their crops. This phase of our work has been in operation so long that a detailed consideration of it is hardly called for.

2. PURE FOOD WORK.

The General Assembly passed what is generally known as the "Pure Food Law" in February, 1899. This law went into effect on August 1st of that year. The first report on the inspection and analyses of food products under this law was published as the December (1900) BULLETIN. In all four reports have been made, with the publication of the detailed results each year, and the fifth report is now in the hands of the printer. That the law is having a very important and beneficial effect is shown by the amount of adulteration given in the four reports already issued, as follows:

In 1900 507 samples were analyzed, 56 per cent. of which were found to be in some way adulterated.

In 1901 308 samples were examined, 35.7 per cent. being adulterated.

In 1902 589 samples were examined, 21.3 per cent. of which were adulterated.

In 1903 477 samples were examined, 32.1 per cent. of which were in some way adulterated.

In 1904 347 samples were examined, 17 per cent. of which have been found to be in some way adulterated.

A summary statement of each year is given below, showing in detail the products which have been analyzed each year and the adulteration to which they have been subjected.

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS, 1900.

Names of Samples.	Total Number Samples.	Not Found Adulterated.	Found Adulterated.	Per Cent. Adulterated.
Beers and other alcoholic drinks	35	8	27	77.14
Breakfast foods	24	23	1	4.17
Butter	11	11	----------	----------
Canned asparagus	9	2	7	77.77
Boston baked beans	1	----------	1	100.00
Celery	2	----------	2	100.00
Corn	70	28	42	60.00
Corn and tomatoes	4	----------	4	100.00
Garden peas	37	7	30	81.00
Lima beans	8	3	5	62.50
Okra	2	1	1	50.00
Okra and tomatoes	8	----------	8	100.00
Pumpkins	8	4	4	50.00
Snap beans	9	2	7	77.77
Succotash	14	13	1	7.14
Tomatoes	55	20	35	*63.63
Catsups	36	1	35	97.22
Flour	37	37	----------	----------
Lard	11	10	1	9.00
Non-alcoholic summer drinks	33	9	24	72.72
Oil	11	9	2	18.18
Sauces	7	1	6	86.00
Vinegar	22	9	13	59.00
Total human foods	454	187	256	56.04
Commercial stock feeds	53			
Total	507			

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS, 1901.

Names of Samples.	Total Number Samples.	Not Found Adulterated.	Found Adulterated.	Per. Cent. Adulterated.
Baking powders	85	69	16	18.8
Coffee	55	35	20	36.3
Condiments	44	35	9	20.0
Jams, fruit butters and preserves	25		25	100.0
Jellies	10		10	100.0
Molasses, syrups and honey	32	6	26	81.2
Sugar	19	19		
Tea	25	25		
Vinegar	13	9	4	30.7
Total	308	198	110	35.7

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS, 1902.

Names of Samples.	Total Number Samples.	Not Found Adulterated.	Found Adulterated.	Per Cent. Adulterated.
Baking powders	12	12		
Butter and butterine (oleomargarine)	22	22		
Canned fruits and vegetables	118	102	16	13.5
Cheese	33	31	2	6.0
Corn meal	17	17		
Compound lard	24	24		
Lard	32	31	1	3.1
Flour	70	69	1	1.4
Non-alcoholic summer drinks	36	10	26	72.0
Phosphates, malts, ciders and bitters	12	3	9	75.0
Prepared mustards and salad dressings	11	1	10	90.9
Tomato catsup and sauces	22		22	100.0
Total human foods	409	322	87	21.3
Commercial stock feeds	162			
Condimental stock feeds	18			
Total	589			

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS, 1903.

Names of Samples.	Total Number Samples.	Not Found Adulterated.	Found Adulterated.	Per cent. Adulterated.	Kind of Adulteration.
Vinegar	62	44	18	29	Untrue to name.
Catsups and sauces	49	0	49	100	Coal-tar colors and preservatives.
Sugar, white	29	29	0	0	
Sugar, brown	16	16	0	0	
Molasses	11	8	3	37.5	Glucose.
Maple syrup	4	3	0	0.0	
Honey	6	4	2	33.3	Invert sugar.
Flour	77	77	0	0.0	
Corn meal	23	23	0	0.0	
Breakfast foods	20	20	0	0.0	
Tapioca	3	3	0	0.0	
Jellies	30	7	23	76.6	Coal-tar dyes and preservatives, glucose.
Jams	14	3	11	78.4	Coal-tar dyes and preservatives, glucose.
Marmalades	3	3	0	0.0	
Apple butter	1	1	1	100	Coal-tar dye and preservative.
Preserves	20	5	15	75	Coal-tar dye, preservtives and glucose.
Phosphates, malts, wines, beers, whiskeys, ciders, tonics.	30	11	19	63.3	Preservatives, coal-tar dye, untrue to name.
Non-alcoholic drinks	20	15	4	25	Preservatives.
Coffee (roasted whole berries)	38	38	0	0.0	
Tea	21	14	7	33.3	Below standard, Prussian blue facing.
Total	477	324	153	32.1	

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS, 1904.

Names of Samples.	Total Number Samples.	Not Found Adulterated.	Found Adulterated.	Per Cent. Adulterated.	Kind of Adulteration.
Flour	59	59	0	0.0	
Breakfast Foods	39	39	0	0.0	
Fresh Meats	12	2	10	83.33	Boric Acid, Salicylic Acid, Sodium Sulphite.
Canned Meats	33	20	13	39.39	Boric Acid, Salicylic Acid.
Canned Fish and Oysters	53	52	1	1.88	Boric Acid.
Canned Fruit	11	11	0	0.0	
Canned Vegetables	27	26	1	3.70	Salicylic Acid.
Canned Corn	16	9	7	43.75	Salicylic Acid, Saccharine.
Prepared Mustards and Salad Dressings	33	8	25	75.75	Coloring Matter.
Cocoa	14	14	0	0.0	Starch.
Chocolate	10	8	2	20.0	Starch.
Butter	15	15	0	0.0	
Cheese	11	11	0	0.0	
Whiskeys	14	14	0	0.0	
Total	347	288	59	17.00	

Summary Statement.—Up to this time chemical and microscopic examinations have been made in the laboratory of the Department of 2,228 samples of food. A great deal of interest has been manifested in this phase of the Department's work, as is shown by frequent letters from within and without the State and requests made by town officials, health officers and individuals in regard to the examination of various materials.

Manufacturers are generally manifesting a desire to comply with the law and to make their products meet all requirements.

Through the information thus distributed in our reports and through the newspapers regarding the brands of adul-

terated foods, a great deal of good has already been done and a foundation laid for a gradual bettering of the quality of food products on our markets. The decrease in adulteration as shown above justifies this conclusion.

3. Concentrated Stock Feeds.

The laws passed by the last General Assembly governing the manufacture and sale of concentrated stock feeds and cotton-seed meal went into operation July 1, 1903. The first report on the inspection and analyses was made in the December (1903) Bulletin. This report included chemical and microscopic examinations of 203 samples of the various stock feeds. The second report is now in the hands of the printer and contains the results of analyses of 500 samples, making over 700 samples analyzed for the year and a half in which these laws have been in operation. Our analyses have shown that there is a large amount of worthless material put into concentrated stock feeds as a filler. Prominently among these are rice chaff, ground corn-cobs, peanut hulls, mill sweepings, etc. We have been examining these products now for five years, and some mills from without the State had, previous to the passage of the stock feed law, become specially noted for the use of worthless diluents referred to above, as we had found them to exist almost universally in their products for three years prior to 1903. While we still find considerable adulteration, some of it seriously reducing the feeding value of the products, there has been a change for the better, and we feel that the law has done a great deal of good. Quite a number of cases of serious adulteration have been discovered before the feeds were sold and their sale and use prevented. In one of these a car-load of wheat-bran had ground with it red corn-cobs to the amount of about 35 per cent. of its weight. Several shipments of considerable quantities of feeds contained rice chaff to the extent of 25 or more per cent.

Sea Island cotton-seed meal was being offered at near the same price as regular upland meal, whereas its feeding value is only about two-thirds that of good upland meal.

The law as executed by the Department is thus seen to have already given substantial protection to our feeders and manufacturers, and will, I am sure, become more useful in the future, as it will certainly be more necessary. An examination of the reports giving detailed results is necessary to fully appreciate what is being done in this line, and its meaning to the users of stock feeds.

4. Test Farms.

This closes the fifth year's work on the Test Farms of the eastern part of the State, and the second year in Iredell County. The main experiments on these farms with field crops are conducted according to one general plan, so that the results may be comparable and furnish data as to the culture and methods of handling these crops in the different soils and sections of the State. This work is being repeated from year to year and will be continued until we feel that we have sufficient reliable data to justify the discontinuance of these experiments.

These tests in the main are as follows:

Cotton and Corn.—Between sixty and seventy different tests have been made with each cotton and corn on one-tenth-acre plats. Twenty-two of these are devoted to different combinations and amounts of the three fertilizer constituents—nitrogen, phosphoric acid, and potash—with the view to determining the best balanced fertilizers and best paying amounts for these crops on these particular lands. Three plats are given to testing the effect of dividing the fertilizer and applying on one plat half of all the constituents at planting and half later, and in two cases to applying all the acid phosphate and kainit and one-half the cotton-seed meal be-

fore planting, putting on the other half of the nitrogen later as nitrate of soda on one plat and cotton-seed meal on the other. Two plats are devoted to different methods of cultivation—ridge and level; ten to rotations, to see if vetch, peas, burr clover, velvet beans, soja beans and peanuts—winter and summer growing nitrogen gatherers—will not collect from the air all the nitrogen that is needed by these crops; two to testing the effect of lime; three to comparing cotton-seed meal, cotton seed and stable manure as sources of nitrogen; three to testing the effect of acid phosphate, fine-ground phosphate rock and Thomas' slag phosphate as sources of phosphoric acid; two to different depths of applying fertilizer, and twenty-five to thirty to testing varieties of cotton and corn, together with different distances of planting in the rows and different width rows, and methods of selecting seed for the improvement of yield.

Cotton Wilt.—The wilt of cotton is becoming more and more prevalent in the State every year. It is a disease similar to that attacking melons and tobacco in some sections and is caused by the clogging of the circulation of the plant by minute organisms, thus causing it to wilt and die for want of food and water. We have conducted this year in Robeson County, on the farm of Mr. J. A. Thompson, near Lumberton, an experiment in co-operation with the United States Department of Agriculture, with the view of obtaining one or more varieties of cotton which will withstand this disease. The farm now owned by Mr. Thompson was sold two years ago at a greatly reduced price because of the prevalence of this disease on the land, and which made it impossible to grow cotton with any certainty. The experiments this year have been quite successful. Several varieties of cotton were found to be more or less resistant to the disease and one variety did all that could be expected of it. Five acres of this kind were planted and the yield was at the rate of 1,349 pounds per acre as against 1,017 for the kind being gener-

ally grown. A considerable quantity of seed of this variety is now available for the use of other parties in the State who are troubled with the disease, and we are in position to enable them to get seed for use in this way.

Peanuts.—Thirty-five plats are given to experiments with peanuts along the lines indicated for corn and cotton, with the idea of obtaining information regarding the best methods of growing, fertilizing and handling this important eastern crop.

Cow-peas.—Fertilizer tests of cow-peas along the line of those for cotton, corn and peanuts have been conducted, together with tests of different times of planting, different quantities of seed when planted broadcast and in the drill, to determine the effect on seed and hay production. In these tests have been included all the varieties of cow-peas which we could obtain and which have numbered between fifteen and twenty each year. A study is also being made of the fertilizing value of the different varieties, as well as of the entire plant and the stubble, together with methods of handling the soil for different crops when the vines are left and when removed for hay. These experiments have been made on sandy soil in the eastern part of the State and also on red clay land at Statesville. They have included between eighty and ninety experiments, all of which are divided into half, one portion being cut for hay and the other half gathered for the yield of peas.

Cow-pea Wilt.—The cow-pea is subject to a disease similar to that already referred to as attacking cotton. We are conducting experiments with it. Other experiments have found that the Iron cow-pea resists this disease, and in our experiments with varieties we have found one or two other varieties which are more or less resistant. This work will be continued.

Experiments With Grains.—A large number of varieties of wheat, oats and rye are being tested on the Edgecombe

and Statesville farms, with a view of determining which variety or varieties will do best in these two sections of the State. It is our purpose to run these tests until we find two or three kinds of each grain which will stand our climatic conditions best and give us the largest yield and then from these make selection for further improvement of yield and quality. Methods are also being tested in regard to preparation of land, time and quantity of seeding, and fertilizer requirements.

Grasses and Legumes for Pasture and for Hay.—On the Edgecombe and Statesville farms over one hundred small plats have been put out in grasses and legumes and combinations of these to test the adaptability and value of native and new grasses and legumes for pasture and hay production, and for use as winter cover crops and in rotation with the usual crops of the sections. Of such of these as have given promise of success our tests have been extended to develop the best methods of growing and handling to obtain the surest and most profitable crops. Up to this time, among the grasses Tall Meadow Oat, Italian Rye and English Rye, early grazing and hay grasses, have done especially well. Among the legumes burr clover and vetch have succeeded splendidly.

Burr Clover and Vetch.—On considerable areas of the Edgecombe farm, for two years, both burr clover and vetch have re-seeded themselves and given excellent pasturage and fine yields of hay. A special Bulletin (July, 1904) on these crops has been issued, giving in detail methods of the preparation of the land, seeding, and management of the crops, together with rotations, which fit well with them. We are growing both corn and cotton year after year on the same land with vetch and burr clover, and have not had to seed either the clover or the vetch after the first year. The yields of cotton and corn have both been largely increased by the winter growth of the clover and vetch, and have enabled us

to grow more cotton and corn with a reduction of the fertilizer bill, by something like 40 per cent. Quite a large number of farmers, in the eastern section, particularly, are putting out these crops, for use as indicated above in the growing of cotton and corn.

Growing Crops True to Name.—We began our experimental work five years ago with tests of a limited number of varieties of cotton and corn. We have increased these until this year we have twenty-nine kinds of corn and twenty-five of cotton. It is our desire to extend this work and include in our tests all the distinct varieties of cotton and corn grown in the State, with a view to determining their merit and to aid in the naming of them, so that we may know which are the same and which are different. There is great advantage in having this information, and tests only will positively give it.

I feel that an important point would be gained if the majority of our farmers could say that they grow a particular kind of cotton or corn and keep the seed reasonably pure. A crop grown under a name has identity, definiteness and individuality, and would have greater value for planting than a mixed or unknown variety, which would yield practically as good results.

Mountain Test Farm.—The Board of Agriculture at its recent meeting accepted the report of the committee appointed at the June meeting to select and purchase a site for a Test Farm in the mountain section of the State. This farm has been located on the Transylvania Railroad, between Hendersonville and Brevard, on what we consider good land for conducting experiments with apples, peaches and other tree fruits, with truck crops, as Irish potatoes, cabbage, celery, etc., and with the general farm crops which are grown or can be grown to advantage in the mountain district of the State. A liberal donation was made by the County Commissioners, the Transylvania Railroad, and individuals to-

wards the purchase of the place as an inducement to have it located at the present site. This, of itself, shows that there is much interest in this phase of the Department's work.

Test Farm for Truck Crops.—The Board of Agriculture, at its December meeting, decided to transfer the Test Farm at Red Springs, which has been conducted on a small area of leased land, to a more eastern situation in the trucking belt. For some time the East Carolina Truck and Fruit Growers' Association and individuals have been making a strong effort for the location of a Test Farm for experiments with trucking crops. The Department has for some time considered this step desirable, but has not found it possible heretofore to undertake the work. We find much interest in the location of the place and we feel that a suitable site can be obtained within a reasonable length of time, when experimental work in the line of truck and other crops in the section will be undertaken.

Interest of Farmers in the Test Farm Work.—We find that the farmers in the different sections are becoming more interested every year in the work we are doing, and in many cases go long distances to inspect the farms and their operations. We encourage these visits, and our superintendents give every opportunity for visitors to see what is being done on the farms.

In addition to this, I feel that we need and should ask for any suggestions which they might have regarding the work which we are now conducting or other experiments which would be of value to their sections.

In many ways the Test Farms are proving of great value and interest. They give us something definite for use in our correspondence with farmers with reference to the use of fertilizers and the growth and handling of various crops. They also give us first-hand information in our Farmers' Institute work, which is developing and becoming more im-

portant every year. I do not consider that a better thing can be done for the agriculture of the State than that which is being done in the experimental work.

Correspondence.

An additional evidence of the growing usefulness of the Department is the greatly increased number of inquiries on various subjects relating to farm and other matters which come to me. During the past two years we have sent out letters to the number of nearly ten thousand and analyses to the number of nearly five thousand, making a total of nearly fifteen thousand for the two years, as against thirteen thousand for the previous two years.

Conclusion.

In conclusion, I desire to commend most fully and heartily the efforts of the workers associated with me. They have been industrious, earnest and faithful, and to them is due a full share of credit for whatever has been accomplished.

It is especially pleasant to say that I find myself under continued and renewed obligations to you, Mr. Commissioner, and to the Board of Agriculture for the uniform interest and consideration shown me in the conduct of the work entrusted to my charge, for all of which I thank you most heartily, and respectfully submit this review of operations for your information and consideration.

Very respectfully,

B. W. Kilgore,
State Chemist.

REPORT OF THE BOTANIST AND BACTERIOLOGIST.

The routine work of the Biological Division of the Department of Agriculture includes many different lines of work. Among these one of the most important is direct correspondence with farmers and others who write for special information. Such inquiries, when referred to the Biologist, are answered as promptly as the case permits by a personal letter. In addition to such special answers, when the question asked seems to be of general interest, the gist of the reply is sent out to the press of the State in form of a mimeograph circular. The average number of letters received by the Biologist is about twenty-four per week. Many of these letters enclose specimens of grasses, seeds or weeds for name and uses. Others refer to plant diseases, or ask for methods of preparing herbs for market, or best markets to ship certain kinds of produce. Occasionally letters which no one else seems able to answer are referred to the Biologist from the Commissioner's office. A sample of such letters was one asking for the most propitious phase of the moon for planting early truck crops. The Biologist answered such a letter, giving the accepted scientific theory of the relationship between the earth and her satellite. The moon has absolutely no influence upon early vegetation. But in early spring moonlight nights are apt to be frosty nights, not because the moon generates frost, but because of the absence of clouds which permit the heat radiated by the earth to pass off into space. When the nights are clouded, and therefore moonless, the clouds reflect back the radiated heat and prevent the temperature passing below the frost point.

There are in North Carolina many wide-awake real estate agents who make a specialty of selling farm and timber lands

to immigrants. To attract the notice of prospective settlers the Biologist has frequently been asked by these agents to prepare statements in regard to the value and uses of different species of timber trees and the possibilities of various special crops in this State. A sample of work in this line is a circular recently sent out to the State press upon the value of certain North Carolina timbers for making paper, and the question of paper-making in general. An immense amount of valuable fiber which may be easily worked up into newspaper is annually wasted in the cotton fields of the State. The bark of the cotton plant is very fibrous, and there has been invented machinery intended for working this material into paper. The rice straw of the coast region and the wheat and oat straw of the middle counties, as well as the flax of the mountain region, might all be profitably utilized for paper-making.

The Biologist has been asked by the owners of certain patents controlling machinery for weaving "China matting" for *data* as to the abundance of the rush, *Juncus effusus,* from which this floor covering is made. This plant is native, wild and very plentiful in the swampy sections of the eastern counties. The plant is also capable of regular artificial cultivation and such cultivation is not more difficult than the cultivation of grass crops. The Juncus is a long-lived perennial which will thrive upon the rich moist or wet bottom lands of all the rivers emptying into the Atlantic within the boundary of North Carolina.

The "Pitch, Tar and Turpentine" industry, which was, according to the old geographies, the former main-stay of North Carolina agriculture, has now been worked out and passed on further south. The more southern fields are also becoming exhausted by the reckless methods of working turpentine farms. The market value of turpentine is on the increase and is likely to go on increasing. Many owners of North Caro-

lina pine lands, once productive in turpentine, have written for best methods of restoring their timber. The only advice given or necessary is to fence out hogs for five years. There are usually left trees enough to reseed the destroyed forests, but the razor-back hog is especially fond of young seedling pines, and being great foragers and rapid travelers, these animals at present succeed in frustrating every attempt of the trees to regain possession of the soil.

There has occurred within a few years past a great revival of interest in matters pertaining to the public schools of the State. This revival has led to a widespread desire to improve the appearance of school grounds. The Biologist has had numerous calls for information about shade trees. Many letters have been written to such inquirers and a circular dealing with the subject has been sent out to the press of the State. The matter of selecting suitable shade trees for particular localities and uses is one of very great importance, since if unsuitable varieties are planted it may be many years before the mistake becomes apparent, and in the meantime great loss of time and money has been suffered. The Biologist has been sorry to see so many maple and cotton-wood or "Carolina Poplar" trees planted in the middle and eastern sections of the State. He has on the other hand always recommended oaks of the red group as by far the best and most desirable shade trees for the upland counties of North Carolina.

During the last two years the State seems to have been flooded with circulars of certain concerns, mostly located in the Western States, urging our farmers to go into the cultivation of ginseng, the roots of which plant these philanthropists offer at prices which will enable any farmer to plant one acre in ginseng at a cost of about $400. These circulars have detailed statements showing the expenses and receipts of a supposititious crop of ginseng, yielding a net return of over $30,000 per acre. It might strike most cautious people that

those who can make such profits from any sort of culture on one acre of land ought to devote their entire attention to producing the merchantable crop instead of advertising for purchasers of seedling roots. The real facts in regard to ginseng-growing are as follows: The plant is botanically known as *Panax quinquefolia.* The roots as found in commerce have no medicinal or other intrinsic value whatever. Their commercial value depends wholly upon the fact that the Chinese have a superstitious reverence for the ginseng root, regarding it in fact as a cure for all real and imaginary ailments. The market price for the dried root is about $4 per pound. It requires six to eight years to grow a salable root from seed. The plant is very sensitive to drought and heat, and a single unfavorable season at any time during the long growing period may ruin a plantation. The Biologist has advised all inquirers to go slow in experimenting with ginseng. There is no possibility of successful cultivation of this crop anywhere in North Carolina east of the foot-hills of the Blue Ridge mountains. In the moist, shaded valleys of the mountain region there is a possibility of growing ginseng, but the chances are that the crop will on the average yield a loss instead of profit. A circular giving plain directions for planting and caring for ginseng has been published and sent to all inquirers.

Each recurring spring the Biologist receives letters stating that stock or children have been poisoned by plants of which a specimen is usually sent for name. These poisonous plants of spring-time are for the most part well known to botanists. They are native plants of sparsely settled regions and their eradication can come only with increase of population. All we can do at present is to warn against them and prescribe the most useful remedies. A large illustrated Bulletin and a press circular on this subject have been published.

The bark of the root of the cotton-plant is a staple crude drug. It is used in compounding a certain class of medicines.

For many years past the bulk of the bark on the market seems to have been gathered at a loss of time and labor to the producers. Druggists have been offering only three cents to five cents per pound for the dried bark, delivered in Baltimore or New York. Within the last two years labor has become so scarce and high-priced in the cotton region that no one would gather the bark for the price offered. The result has been the exhaustion of the market supply and the price of the drug in the New York market has during the greater part of the year 1904 been about forty cents per pound. This fact has led to numerous inquiries of the Biologist as to methods of preparing the bark and best markets to send it. A circular has been published giving methods for preparing the bark and names of buyers. The Biologist has subsequently learned of an evident "combine" on the part of manufacturing druggists to keep the price of cotton root bark at or near its former unprofitable price—about five cents per pound. Letters from manufacturers of medicines have been forwarded by farmers to the Biologist, offering from five cents to eight cents per pound for first-class bark, while at the same time the bark was selling in the New York market for thirty-five to forty cents per pound. The druggists evidently supposed the farmers did not understand the facts and would sell their bark for any price offered. The Biologist has advised farmers to collect at first only small samples of the bark and submit these to the purchasers, and collect no more bark unless the price offered is above ten cents per pound f. o. b. nearest railroad depot. The labor even of children can be better utilized on the farm than in gathering cotton root bark for less than ten cents per pound.

In the fall of 1902 one of the members of the Board of Agriculture called the attention of the Biologist to reports being circulated in the newspapers of the State of alleged cases of death due to poisoning called the "Cabbage Snake."

Letters were at once written to several persons—all in the mountain region of the State—whose names were mentioned in connection with the cases of alleged cabbage snake poisoning. Samples of the supposed to be deadly creature were in this manner obtained, and on examination all proved to be a perfectly harmless Gordius worm which occurs naturally as an intestinal parasite of caterpillars, grasshoppers and other insects. The presence of this worm on cabbage plants or cabbage heads was evidently due to the previous abundance of cabbage worms. The Gordius worms are never parasitic upon humans or vertebrate animals. They are not snakes, are not venomous, and by no possibility could they harm any human being even if they were eaten by the quart. The sensational newspaper stories were wholly untrue. Yet it was found that many persons who had grown plots of cabbage or purchased cabbage for home use were throwing this good food on the manure pile on account of the panic created by these foolish stories. A circular giving the true facts of the case was at once sent out to the press and very widely copied all over the country. Yet, notwithstanding this, we still continue to hear of alleged deaths caused by "the deadly cabbage snake," but for the most part in other States than North Carolina.

North Carolina possesses numerous and great advantages for raising fruit. Here, as in other fruit-growing sections, there is annually a great waste of unmerchantable fruit. To save this waste, even in a small degree, is to add an important item to the agricultural income of the State. In this line the Biologist has published a lengthy and comprehensive Bulletin on Canning, Preserving and Evaporating Fruits and Vegetables. Shorter papers dealing with Vinegar-making, Wine-making and Cider-making have also been published. These papers have seemed to fill an urgent need. All of them have been republished in part or in whole by

agricultural journals in other States and in some foreign countries. The series of practical papers dealing with the "fermentation industries" will be continued until all of importance to the farmers of North Carolina have been dealt with. Among the subjects of special interest to North Carolina farmers is or should be the growing of sweet potatoes for production of alcohol, dextrine and starch. The growth of the Irish potato for alcohol is one of the main-stays of French and German agriculture. Yet the sweet potato is probably superior to the Irish potato for this purpose, and it can be raised in North Carolina for less than half the cost of growing the Irish potato in Germany, taking same weights of produce. There is a very large and growing demand for potato starch and dextrine for use in sizing cotton cloth. There seems no reason why these commodities should not be produced in North Carolina.

In the November, 1901, number of THE BULLETIN of the Department the Biologist published a brief history of silk culture, with a review of the former attempts made to produce silk in North Carolina, and the possibilities of reviving the industry. This paper attained an immediate and widespread popularity. The succeeding spring a small supply of silk-worm eggs was imported from Italy and distributed to some one hundred families in North Carolina. These families were for most part farmers who had one or two old mulberry-trees on their lands, the remnants of plantations set out in the early years of the nineteenth century. Few if any of these experimenters had ever seen a silk-worm or silk-cocoon. They had no facilities for economizing time or labor. The experiment was begun merely to see what could be done. No expectation was entertained that any salable cocoons could be produced the first season. In fact, however, a large lot of very fine silk was the product of this first attempt. This silk was all sold at from ninety cents to one dollar per pound. The results were very encouraging. The most val-

uable lesson taught was that silk can be profitably grown in nearly every county in North Carolina. The labor utilized in producing this crop is that of children of from six to fifteen years and the very old or feeble members of the family for whom there is no other species of remunerative labor.

A ten-year-old boy or girl by growing silk may in six weeks of early summer earn from thirty to fifty dollars. This statement assumes that there is an abundance of leaves of the white mulberry at hand—not large trees difficult to get at, but low shrubs or a hedge from which the leaves may be gathered without climbing. Silk-growing is no get-rich-quick scheme. The work requires the utmost care and conscientious effort upon the part of the attendant during the six weeks of the silk season. The season being so short, silk-growing can never become a special or all-the-year business. It is not recommended as a substitute for any employment now open to persons who can do remunerative work. It is most eminently suited for the younger and aged members of the family who need money and the comforts money may buy, and who are yet unable to do any ordinary income-producing work. If every farm in North Carolina which has a dry soil, such as is known to be favorable to the peach-tree, had from one hundred to two hundred white mulberry-trees, and grew silk by the kind of labor just mentioned, the entire face of country life would be greatly and permanently altered for the better. Every nation which has made silk-growing a general household industry has acquired enduring wealth and raised its agricultural class above brutish stolidness and desires. At the present writing the outlook for silk culture is bright. Already there are prospectors looking for locations for silk mills where silk can and is being locally produced. We may even hope to see silk factories and silk reels as plentiful as we now see cotton mills and cotton-gins.

Since June, 1902, the North Carolina Board of Health has made an arrangement with the North Carolina Board of Agri-

culture whereby the two boards conjointly use the services of the writer and the bacteriological facilities of the laboratory in the Department's building. The bacteriological work of the Board of Health was begun in 1900, when the Board of Agriculture generously permitted the Board of Health to send samples to the undersigned, then employed solely by the Board of Agriculture. From this small beginning the bacteriological work of the Board of Health has developed until it has now become one of the most important health and life-saving agencies controlled by the State. Great credit is due to the Board of Agriculture for its part in building up the health work of the other board, and when the history of the Agricultural Board comes to be written probably no more important service can be credited to it than its assistance in building up the bacteriological part of the work properly belonging to the Board of Health.

All of which is respectfully submitted,

GERALD MCCARTHY,
Biologist.

HON. S. L. PATTERSON,
Commissioner of Agriculture.
December 10, 1904.

REPORT OF VETERINARIAN.

Hon. S. L. Patterson,
Commissioner of Agriculture.

My Dear Sir:—Pursuant to your request, I submit the following report regarding the work of the Veterinary and Animal Husbandry Division of the Department:

Animal Husbandry.

By legislative enactment the State Board of Agriculture is charged "with investigations adapted to promote the improvement of milk and beef cattle."

Is there need of more live stock on North Carolina farms, and if so, why? These questions are fully answered by the simple statement that while our farms yield eighty-nine millions of dollars worth of products annually, we feed only ten million dollars worth of these products to live stock.

In other words, we take eighty-nine pounds of fertility from our soil and put back less than ten pounds in the form of stable manure.

It is readily seen that no bank, not even a bank of North Carolina soil, can stand that sort of drafts and deposits. Then, in what way do we keep up the balance of fertility in order that our crops may draw on it? By the purchase of commercial fertilizers to the extent of about $8,000,000 worth in 1904.

It appears to me that $8,000,000 is too heavy a tax on our agriculture. It is about 9 per cent. on our entire agricultural production. Moreover, our present system of farming means that these fertilizers must be steadily increased year after year, to produce equal effect, and the price of fertilizing materials has also steadily increased and will probably continue to do so. Can we stand this increasing burden which

falls with regular certainty on our agriculture, in years of light crops as well as in years of heavy, and in years of low prices as well as in years of high prices? I do not believe we can, and, therefore, a change in our system of farming seems to me inevitable.

But the necessity for more live stock in our system of agriculture does not rest solely on the need of our soils for plant food. In fact, analyses show that many of our unproductive soils have sufficient plant food to grow numerous crops if it were in such condition that the plants could use it. For instance, some of our red clay soils have been found to contain 4 per cent. of potash, which is more than is usually contained in commercial fertilizers and just twice as much as is contained in the common 8-2-2 goods so generally used. The productiveness of such a soil is not so much a question of plant food, as the mechanical and other conditions that will render the plant food already in the soil more readily available for the growing crops.

The great need of our soils is humus—decaying vegetable matter. This decaying vegetable matter is essential to every productive soil, because it makes it more mellow; because it increases its ability to hold water for the growing crops; because it prevents leaching and washing; and because it furnishes plant food. In fact, without it, even commercial fertilizers will not give satisfactory results, and, therefore, more decaying vegetable matter in our soils is a necessity which even increased applications of commercial fertilizers will not obviate. This humus has been exhausted in our soils by our system of agriculture, which carries away eighty-nine dollars worth of crops for every ten dollars worth fed on the farm and returned to the soil; by the kinds of crops grown, which generally demand clean cultivation; and by the warm, wet winters which favor washing and leaching.

How can this humus be most economically put into our soils?

By the growing of more forage crops and the feeding of them to better live stock.

Is it really necessary to feed these crops to live stock? Why not turn them directly into the soil? Because they may be fed to live stock and from 75 to 90 per cent. of their fertilizer value obtained in the manure, if it be carefully saved; therefore, it is apparent that we cannot afford to waste their entire feeding value to save from one-tenth to one-fourth of their fertilizer value.

The aim of this Department has been to induce every farmer, no matter how small his operations, to keep a few more animals of higher quality and give them better care and more feed; for in this way only can he economically supply his soil with that humus necessary to high and profitable crop production. In short, the growing and feeding of more live stock is no longer a matter of choice with us, but has become an absolute necessity. Our washed and gullied soils show plainly the need for more humus, and common sense and science unite to prove that this humus can be most profitably supplied through stable manure; while our increasing fertilizer bills but foretell the final failure of a system of agriculture which feeds to live stock and returns to the soil but 12 per cent. of that which it produces.

Realizing this need for more live stock in North Carolina agriculture and the importance of wider knowledge concerning the industry, considerable effort has been made to arouse a greater interest in animal husbandry and to disseminate information concerning the breeding and economical feeding of farm animals. This work has been done in the form of lectures at over sixty farmers' meetings, in as many counties, in the State, during 1904, contributions to the Department Bulletin and the agricultural press; and the encouragement of the importation of a better quality of live stock. The Test Farms of the Department are being stocked with such numbers of cattle, sheep and hogs as should be found on every

farm of similar size and the produce of these animals distributed over the State at a reasonable price. Moreover, to further aid in the introduction of improved live stock we have induced a prominent and reliable breeder of Louisville, Ky., to sell at public auction, thirty pure-bred short-horn cattle, at the Iredell County Test Farm, near Statesville.

The Cattle Quarantine.

After it became established that the disease variously known in this and other Southern States as splenic, Spanish, Texas or tick fever, distemper, dry or bloody murrain, red water, acclimation fever, town-cow disease, etc., was naturally conveyed solely by the common Southern cattle tick (*Boophilus annulatus*), the United States Secretary of Agriculture designated a line, extending across the country from the Atlantic Ocean to the Pacific, which was intended to divide the section infested with the cattle tick from that in which no ticks existed. No cattle from south of this line, that is, from the tick-infested area, are allowed to be driven or in any way transported northward across this line, except under certain strict regulations, and then only for immediate slaughter. All of North Carolina was not permanently infested with this tick, but that part east of the mountains was, and, consequently, all of the State was subjected to these quarantine restrictions. The Secretary of Agriculture has authority to exempt from the operation of this quarantine any district that is free of the cattle tick, where the State authorities will enforce such regulations as will effectually prevent ticks being carried into such district, giving assurance thereby that cattle for shipment originating within said districts are unable to carry infection with them to other markets. In order to secure the advantages thus accruing the Department has co-operated with the United States Department of Agriculture and secured exemption from the quarantine restrictions for a number of the western counties

of this State, thus securing a valuable saving to the cattle growers of that section.

To those familiar with the conditions under which Southern or quarantined cattle sell in the principal markets of the country, it is well known that because they cannot go on to Northern pastures or into Northern feed lots, but must be sold for immediate slaughter or go back home, they sell from one-half to one cent per pound, live weight, below that brought by cattle of the same quality, but not under the quarantine restrictions. To this must also be added the cost of providing separate pens and unloading chutes and disinfecting the cars, which the government requires the railroad companies to do. It is, therefore, evident that the gain to the twenty-two counties of this State exempted from these quarantine restrictions is not less than from one-fifth to one-seventh the selling price. In 1899 these counties sold over $800,000 worth of live stock (estimated from the United States Census Report), which means a clear annual saving by the exemption from the quarantine restrictions, of between $115,000 and $160,000. The total cost of maintaining the line across this State does not amount to more than $500 annually.

The Extermination of the Cattle Tick.

When the work of tick extermination was begun in North Carolina under the direction of my predecessor, Dr. Curtis, it was largely an experiment, and was not generally regarded as practicable. At first little interest was taken in the effort, but to-day those interested in live stock sanitary matters, from California to South Carolina, are making inquiries regarding our plans of work and the results. In fact, over the entire infected area the tick is gradually coming to be regarded as an exterminable pest, and one demanding State and Federal attention in the interest of the cattle industry. The injury

done to the growth and development of infested cattle; the large death loss from tick fever, the magnitude of which is being more fully appreciated as the disease becomes more generally known; the interference with free exchange of traffic, caused by the quarantine restrictions and the danger of loss from tick fever, which retard the improvement of the quality of our live stock; and the closing to us of the best markets, except under almost prohibitive conditions, combine to form such a terrible bill of indictment against the tick and such a heavy embargo on the development of the cattle industry of the South, that it seems almost incredible that now, since we know how easy it is to exterminate him, more effort is not being made to free the industry of this, the only real obstacle to its successful development.

The accompanying illustration shows the location of the Federal quarantine lines in 1902 and 1905. Only 16 counties were free in 1902 and in four of those, Henderson, Transylvania, Macon and Cherokee, ticks were numerous. In 1905 there will be 22 entire counties free and parts of two others, while infection has only been found in one county west of the Blue Ridge this year. In other words, Caldwell county and the north half of Burke were released from quarantine in 1903, and we have the promise of the Federal Inspector in charge of this work to recommend the addition of the counties of Wilkes, Catawba, Lincoln, Gaston, south half of Burke and part of Surry to the exempted area for 1905.

FEDERAL QUARANTINE LINE ACROSS NORTH CAROLINA, 1902.

FEDERAL QUARANTINE LINE ACROSS NORTH CAROLINA, 1905.

This, it seems to me, should be regarded as satisfactory progress, and with a continuation of the work I think we can reasonably hope for the addition of two or three counties each year.

Farmers' Institutes.

The Farmers' Institute has been on trial as a method of extending agricultural knowledge for over twenty years, and has now become established as one of the most important educational movements of the century. At this date it should be a waste of time, if not ridiculous, to further discuss the importance of this work, and, therefore, suffice it to state that in my opinion there is no other way in which this Department could annually spend a liberal amount that would more certainly carry great good to the farmers of the State and bring them in touch with the work of the Department and agricultural progress in general. In short, it seems to me, the time has come when the Farmers' Institute should be considered and treated as an important and fixed line of work of the Department and put upon a permanent financial and business basis. To obtain the best results these institutes should be held regularly in every county in the State and at stated intervals of not over one year. In this way the Farmers' Institute should soon become established as a well-known and important institution that would require less advertising and command more attention as the years go by. It is not only folly but also a waste of money and effort to hold institutes at irregular intervals of two or three years. At least one institute every year, and preferably at the same season each year, is the least that should be attempted.

During 1904 institutes have been held in sixty counties. This is at least two, and probably three times the number held during any other year. On the whole, these institutes were fairly well attended and in those counties where institutes were held last year the attendance and interest this year have been very encouraging. No record of the attend-

ance at institutes was kept previous to 1903, but while many more institutes were held in 1904, and quite a number of these in the more sparsely settled mountain regions, still I am of the opinion that the average attendance this year was double that during 1901 and 1902. Very successful institutes were held in 1904 in the counties of Mecklenburg, Cabarrus, Davie, Stanly, Union, Cleveland, Beaufort, Gaston, Gates, Iredell, Montgomery, Northampton, Perquimans, Pitt, Warren and Washington, and, considering everything, fairly successful institutes were held in Bertie, Burke, Alexander, Alamance, Caldwell, Chatham, Clay, Edgecombe, Forsyth, Franklin, Granville, Hertford, Lincoln, Madison, Moore, Pasquotank, Camden, Currituck, Polk, Randolph, Rowan, Catawba, Guilford, McDowell, Rutherford, Watauga and Yancey.

During 1904 fully half my time has been devoted to organizing and attending Farmers' Institutes; in fact, during the year I have made one or more talks at farmers' meetings in sixty-two counties in the State.

The Control of the Diseases of Live Stock Within the State.

This Division cannot, nor does it attempt to, treat individual cases of diseased animals, except by correspondence; still, it is our policy to visit all reported outbreaks of contagious or infectious diseases and all outbreaks of any disease when a sufficiently large number of animals are affected to render it of general interest to a community.

Of the communicable diseases affecting live stock in this State, tick fever, popularly known as distemper or Texas fever, and hog cholera continue the most common and fatal. Such diseases as tuberculosis, blackleg, glanders, etc., while not unknown in this State, are fortunately much less common than in many other sections of this country.

Tick Fever.—More cattle die from this disease than from

all others combined. In the majority of cases the true nature and cause of the disease is little suspected, even by the owners, the animals dying before the ticks have grown large enough to be visible to the ordinary observer. These heavy losses are due to the fact that, even in what is known as the infected area, many farms are free of ticks and therefore the cattle raised on these farms are as susceptible to the disease as those raised in New York or Minnesota; for, in order to safely acquire immunity the calves must get ticks on them before they are six months old, which nearly always occurs on the tick-infested farms. Hence, the freedom from losses when there are abundance of ticks, or none of them at all, and the heavy losses where there is any commingling of cattle from tick-free and tick-infested farms. This renders cattle traffic extremely dangerous in a large number of the counties of the State and results in losses, the aggregate of which are simply amazing to those not familiar with the conditions.

Hog Cholera.—This disease is a source of great loss to the farmers of the State. Many outbreaks have been reported to this office. A few of these have been visited, and in all cases information concerning the best known methods of control and eradication have been given. Much of the ravages of this disease could be avoided by a better observation of sanitary regulations. The fact that the disease is due to a specific germ and cannot break out in any herd unless that germ has been carried there by buzzards or other birds, by running water, the wind, on the feet of visitors or attendants, by other hogs, or by hogs coming in contact with the places or things contaminated by sick animals, is not properly appreciated by the average farmer and as a result the disease is often spread when proper precautions would have prevented it. Proper regard for these facts, by burning all hogs dying of disease, excluding from the premises all visitors and others likely to have been where the disease exists

and removing the well hogs (not the sick ones) to new and clean quarters as soon and as often as a sick animal develops, would very greatly reduce the losses from this disease.

Inoculations to Prevent Tick Fever.

The presence of the fever tick (*Boophilus annulatus*) over the greater part of the State offers the most serious obstacle to the improvement of our common cattle through the use of imported pure-bred bulls.

All cattle that are over one year old before becoming infested with ticks are susceptible to the disease, and fifty per cent. of them die. This renders the introduction of pure-bred stock extra hazardous and expensive.

In recent years there has been developed a method of preventive inoculation, with blood from an animal previously infested with ticks. Susceptible animals are thus given a mild attack of the disease from which they usually recover and which enables them to withstand the infection introduced by the ticks.

During the last three years I have inoculated over sixty head of cattle for citizens of the State with a loss, from the inoculation and subsequent tick-infestation, of only one animal, whereas without inoculation fifty per cent. would almost certainly have died.

This work is done free of charge for any farmer in the State who may request it, in order to encourage the introduction of pure-bred stock.

The work briefly reviewed in the foregoing pages, my duties as Veterinarian to the Agricultural Experiment Station, and Professor of Veterinary Science at the Agricultural and Mechanical College, and the gradually increasing correspondence and office work connected with the same, have combined to fully occupy my time and energies.

Very respectfully submitted,

Tait Butler,
State Veterinarian.

REPORT OF ENTOMOLOGIST.

MR. S. L. PATTERSON,
Commissioner.

SIR:—The following report covers the principal operations of the Division of Entomology for the past two years:

The duty of this office is to give information regarding insects, especially such as are injurious to the interests of man. Reliable estimates place the annual loss in the United States from insect ravages at $400,000,000, or about $5 for every man, woman and child. Yet it must be borne in mind that this comes almost entirely from the farming classes. During the Spring of 1904 the Strawberry Weevil caused a loss in eastern North Carolina of not less than $100,000. Much of these losses can be prevented by proper management or by applying the proper remedies at the proper time.

GROWTH OF WORK.

During the last two years there has been a constant and steady growth in the amount of work carried on by this office in its various lines. Some idea of this growth may be had by a study of the following table, which compares the work for 1903-'04 with the two previous years, which are reported upon in the last report to the Legislature. These figures are as accurate as it is practicable to make them:

	1901-1902.	1903-1904.	Increase.
Number of nurseries inspected (for two years)	90	106	16
Acreage in nursery stock inspected (for two years)	1,200	1,600	400
Counties where San Jose Scale is known to exist	22	47	23
Premises where San Jose Scale is known to exist	about 125	192	67
Trees treated by owners for San Jose Scale (for two years, estimate).	50,000	100,000	50,000
Miles traveled in Entomological work (for two years)	*12,000	†21,000	9,000
Number of letters written (for two years, estimate)	2,200	4,000	1,800

*Entomologist alone.
†Entomologist and assistants.

During the years of 1901-'02 the Entomologist was alone in this work save for two or three weeks in the summer of the latter year. During the years of 1903 and 1904 he has had assistance a large part of the time and this accounts for the great increase in traveling work. Mr. G. M. Bentley, who has now been appointed the regular assistant, has been doing most excellent work.

Brief mention may here be made of some of the more important phases of work carried on by this office.

Nursery Inspection.

All nurseries in the State have to be inspected once each year by the Entomologist or others working under his direction. The object of this inspection is to detect injurious insects or disease if they shall appear in any nursery and prevent their being disseminated through the sale of nursery stock. The great stimulus to fruit growing in the past few years has resulted in a considerable increase, both in the number of nurseries and the amount of stock grown by them.

Orchard Work with San Jose Scale.

In this work our object is to locate, so far as practicable, all orchards or premises which are infested with the San Jose Scale and give full information to the owners regarding the manner of controlling the pest. That it can be profitably and successfully combatted is shown by the fact that at Southern Pines, Moore County, where the scale has been thoroughly established for many years, the well-sprayed orchards have produced profitable crops of fruit for five consecutive seasons, and all prospects point to increased profits in the future. The best orchardists in that vicinity, so far from giving up in despair, are enlarging their fruit interests.

The introduction of the Lime-Sulphur-Salt Wash as a remedy for the scale, marks a new era in the combat with this pest. Although it has always been practicable to keep

orchards in profitable condition even when infested (as shown by the best orchards at Southern Pines), yet this wash has greatly simplified the matter of its successful control. Last year marked the first extensive use of this wash in this State, and approximately 75,000 trees were treated with it, most of these being in the vicinity of Southern Pines. This year we expect it to be still more extensively used.

Traveling.

The expenses incurred in carrying out the various inspections are quite considerable and are a serious handicap to the active prosecution of work in a State of the magnitude of North Carolina. The work of this office has touched nearly every county from the Smoky Mountains to the Atlantic, but much of it has to be done by correspondence only, as actual visits to the localities concerned would entail heavy expense.

County Correspondents.

In order to offset in some degree the disadvantage just mentioned we have lately undertaken to select a list of County Correspondents. These parties are expected to take a special interest in the work of this office and we will expect to give special attention to their inquiries. We now have a list of about sixty such persons, covering between thirty and forty counties. It is our hope by means of these agencies to keep the public better informed regarding insect pests.

Correspondence.

The number of letters received making inquiries about insects is steadily increasing. So far as possible we are meeting these inquiries in our publications, but the interest being felt in this subject by the farmers is far in excess of our ability to supply printed information. By direct letter we are also better able to meet the specific needs of each individual.

Publications.

The Bulletin of this Department for June, 1903, contains a great deal of information relative to insect pests. This was practically a reprint of The Bulletin for June, 1901, revised and brought down to date, with the addition of an adequate article on the spraying of fruit trees, etc. The demand for the June, 1901, Bulletin had been so heavy that the edition was exhausted and the demand for the revised edition has been considerable.

We have also been issuing a series of "Entomological Circulars," the object of which is to treat of our various insect pests in the plainest, briefest and most practical manner possible. The first one of this series was issued in September, 1903, and up to date twelve have been issued, with two more in press, as follows:

No. 1. The Hessian Fly.
No. 2. The Cotton Boll-worm.
No. 3. The Round-headed Apple-tree Borer.
No. 4. Spraying Apparatus.
No. 5. Lime-Sulphur-Salt Wash for San Jose Scale.
No. 6. Spraying Apples and Pears.
No. 7. The Peach-tree Borer.
No. 8. The Harlequin Cabbage Bug.
No. 9. The Potato Beetle.
No. 10. Preparation and Use of Kerosene Emulsion.
No. 11. The San Jose Scale.
No. 12. The Strawberry Weevil.

In Press.

No. 13. The Cotton Boll-weevil.
No. 14. Lime-Sulphur-Salt Wash.

Cotton Boll-weevil.

Great uneasiness now prevails throughout the cotton States concerning the Cotton Boll-weevil. The numerous reports

of its appearance in this State have proven to be erroneous in every instance. At the present time the insect is not known in this country outside of the eastern half of Texas and the adjoining western one-third of Louisiana.

The spread of this pest is of course a very serious matter and every precaution should be taken that it shall not be accidentally introduced into this State. Yet at the same time it is safe to assume that it will never cause the permanent abandonment of cotton-growing in any of the Southern States.

For the enlightenment of our people we have had a large number of *dead* weevils sent us from Texas, and these have been distributed among our farmers to enable them to detect the pest more readily should it appear in this State at any time.

Collection of Insects.

The collection of the insects native to this State is growing constantly. About 30,000 to 35,000 specimens are now accumulated—some harmful, some beneficial, and some neutral, in their relation to man. This collection is a great help in the teaching work at the College and is absolutely indispensable in carrying on our regular office work. It contains, in various stages, almost every serious insect pest known to the State. This collection is open to inspection at all times.

Respectfully submitted,

Franklin Sherman, Jr.,
Entomologist.

REPORT OF THE HORTICULTURIST.

Hon. S. L. Patterson,

Commissioner of Agriculture.

Sir:—In accordance with your request of recent date, the report of the Division of Horticulture since its establishment, is submitted herewith.

On May 1, 1904, I entered upon my present duties as State Horticulturist. Since then my time has been largely occupied in investigating the present status of the different horticultural industries in the State, studying their needs and problems, and formulating plans for future work.

It is doubtful whether any other State in the Union affords better soil and climatic conditions for the development of large and diversified horticultural industries than does North Carolina. Rising from the sea level in the east through all gradations of muck, sand, sandy loam, clay, clay loam, to the rich cove and valley lands of the mountains in the west, soils in great diversity may be found, suited to the growth and development of all those vegetables and fruits which reach perfection in temperate and cold temperate regions, and to some peculiar to warmer regions.

It is not to be wondered at, if under conditions such as these the problems confronting those engaged in the several lines of work should be no less in number than the crops which are grown. To the solution of these problems the Division of Horticulture must devote its main strength and energy and the major portion of its time.

The Trucking District.

The principal crops of the eastern trucking belt are strawberries, cabbage, Irish potatoes, lettuce, cantaloupes, cucumbers and dewberries, and there is great need for investiga-

tion work with all these crops. The kinds, quantities and economical use of fertilizers, the varieties of the several crops, the method of cultivation, the insects and their control, the diseases and the means by which they may be prevented, and in short all the details of handling these several crops from seed to market, are the pressing and urgent problems which demand attention on our part because more and more urgent is becoming the need of definite detailed knowledge. This knowledge is vitally important for the growth and development of the industry, necessary for the man long engaged in the industry to help him in solving the problems by which he is confronted, necessary for the man who desires to engage in the industry to enable him to undertake his work intelligently.

The introduction of new crops or the bringing forward of old ones is equally in need of attention, and in this work must not be left out of consideration, while irrigation must come in for its share of attention.

The Western Trucking and Fruit Region.

The trucking crops which have been most developed in western North Carolina are Irish potatoes and cabbage, and there appears to be every reason why these crops should receive still greater attention. The western section in nowise comes into competition with the eastern one, because of the difference in time of the maturity of the crops. It is a fact that during the summer months the Southern markets, the natural markets of western North Carolina, are poorly supplied with fresh vegetables. No sooner does the northward movement of truck cease in spring or early summer, than a southern movement in the same commodities begins from northern sections. Western North Carolina can and eventually will supply an ample share of this produce.

Many other crops should be brought to the front, celery, strawberries for local consumption, tomatoes and sweet corn may be mentioned among the number.

In eastern North Carolina large quantities of Irish potatoes are used for seed every spring. There appears to be no reason why these may not be produced in the western part of the State. Thus in more ways than one, the western region may be made to fit into and supplement the work of the east.

In addition many of the small fruit crops, such as blackberries, raspberries, currants, gooseberries, demand attention.

The problems confronting the apple growers of the west are of paramount importance and those engaged in the industry are much in need of assistance. Plans have been laid looking to the solution of these difficulties.

Central Region.

Except in the southern section, in the vicinity of Southern Pines, the horticultural industries are not likely to take a place of first importance. But a large variety of fruits may be grown for local consumption, and the Piedmont section is doubtless as well adapted to the development of a pear industry as any region in the country. This industry should be developed.

In the peach belt, the principal difficulties are those concerned with the diseases and insects of the peach. The former demand attention.

Cabbage Experiments.

Although handicapped to a great degree by being unable to carry on work on our own ground, yet we have, through the kind co-operation of one of the members of the Board of Agriculture, Mr. William Dunn of New Bern, been enabled to start some experimental work which we have every reason to believe will prove beneficial to the eastern truckers. Tests

of cabbage varieties are under way. Two hundred and seventy-nine samples of seed of different kinds were secured from different sources. Of these eighty-nine were supplied by the Section of Seed and Plant Introduction United States Department of Agriculture, and the remainder were purchased of seed dealers. The lot of seed from the National Department is particularly important, as we know definitely where and by whom the samples were grown, and we are certain of securing seed from the same sources for future work.

The objects of this work are:

1. To determine the best varieties of cabbage from the standpoint of production and quality for the eastern section.

2. To determine the best source from which the seed can be secured and whether there is any difference in different strains of the same variety.

3. To determine whether foreign or domestic seed is preferable. At the present time the chief sources of our cabbage seed supply are Holland, Denmark, England, France and Rhode Island.

4. To determine in some measure, how many different names the same variety is sold under.

In addition to this we have undertaken, at Mr. Dunn's suggestion, a line of work to demonstrate the best time at which to set the plants in the field.

It is our hope to be able to continue this work from year to year. The number of samples of seed used this year is large. At the end of this season's work we shall be able to greatly reduce this number and the second year's work will be carried on only with such varieties as merit further trial and with such new varieties as we deem it advisable to incorporate in the test.

Farmers' Institutes.

During the latter half of August, all of September, and the first half of October, my time was occupied entirely with

Farmers' Institute work. Thirty-four institutes were attended, at which some sixty addresses were delivered on apple growing, general fruit culture and soil amelioration. The interest taken in these subjects at all the institutes was excellent. That this line of work is effective there is no room to doubt; that it brings the Department workers into close touch with the farmer, his needs and his problems, and enables him to approach these problems in a practical way, cannot be gainsaid, yet it may, in time, interfere seriously with investigation work.

Correspondence.

The correspondence of the Division is steadily increasing and now takes a considerable portion of our time. Numerous inquiries are received concerning the culture of different crops. Many specimens of fruit have been sent in for identification.

In conclusion, I desire to express my appreciation of much kindly assistance rendered by my co-laborers, and by you, Mr. Commissioner, and to different members of the Board for the hearty support extended me in inaugurating my work.

Respectfully submitted,

H. Harold Hume,
State Horticulturist.

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FLY IN WHEAT—HOW TO CONTROL IT.

THE HESSIAN FLY (*Cecidomyia destructor*, Say).

GENERAL.—This is the insect which is commonly known as "Fly" in wheat, and is a serious pest in North Carolina throughout the piedmont region, and no doubt also occurs in the mountain valleys. The name of "Hessian Fly" is applied to it because it is supposed that it was first brought into this country in straw which was sent to the Hessian troops from Europe during the Revolutionary war. It is now widely distributed throughout the western part of our State and as far west as Kansas and Nebraska.

LIFE HISTORY.—The adult insect is a very small, slender, blackish, two-winged fly, which resembles a small mosquito. The adult female deposits eggs on the young wheat leaves, usually selecting those that are near to the ground. The eggs hatch into small whitish maggots, which work down to the stalk, feeding on it near the joints, gnawing away the tissue beneath the base of the leaf. Here it grows to maturity, when it changes to what is known as the "flax-seed" stage, which is more properly known as the *pupa*. It is oval and brown in color, suggesting the seed of the flax in general appearance. In this stage the insect is entirely helpless and takes no food; the maggot is simply transforming to the adult fly. We see, then, that there are four distinct stages of existence in the life of the insect: (1) the egg; (2) the larva, or maggot, which does the damage; (3) the pupa, or "flax-seed"; and (4) the adult fly.

TWO BROODS EACH YEAR.—In this State there are two complete generations of the insect each year. One brood of adult flies appears and lays eggs in the fall, and the other brood emerges and deposits eggs in the spring or early summer.

THE STORY OF A YEAR.—Let us begin when the farmer sows his wheat in the fall, and follow the crop and the fly at the same time through the course of a year, and we will then be in a position to consider the matter of remedies more intelligently.

Suppose the wheat is sown in early October and is nicely up by the 20th of that month. About the 25th the fall brood of flies appears and eggs are deposited on the young wheat. The maggots which hatch from the eggs work around the joint of the stalk near the ground, feeding on the tender, juicy fiber. Here they reach maturity in about four weeks and change to the pupa (flax-seed) stage to pass the winter. By this time the infested plants are weakened and begin to turn to a brownish or sickly yellowish color. The adult fly does not emerge until the following spring, in April or May (specimens bred from stalks sent to me emerged between May 4th and 18th), and after mating, the female deposits eggs for another brood. The flies themselves do no harm other than to lay the eggs, and when this is done they perish. The eggs hatch in a week or ten days and the maggots continue the destructive work of feeding around the joints of the stalks, become mature and transform to the pupa (flax-seed) stage by harvest. The grain is cut and the stubble which contains the developing insects is left standing in the field. Another field is sown to wheat in early October and the brood of flies emerging

THE HESSIAN FLY.

a, Egg; *b*, larva or maggot; *c*, "flax-seed" or pupa-shell; *d*, pupa removed from case, all enlarged; *e*, fly laying eggs on leaf, natural size; *f*, female; *g*, male, enlarged; *h*, stalk of wheat infested, natural size; *i*, parasite, much enlarged.

(After Riley, 3d Report U. S. Entomological Commission).

from the old stubble in the latter part of the month flies to the new fields, deposits eggs and dies.

REMEDIES.

Introductory.—There are numbers of different methods of combating the Hessian Fly, any one of which will be found very beneficial, but the most effective way to deal with it is to combine all three, or some two, of the methods here presented. In any case, the first method given should always be employed.

1. Late Planting.—If there is no wheat up when the fall brood of flies emerges, they must either die without depositing eggs or must lay them elsewhere. *No eggs, no fly;* and the field in which none of the eggs are laid cannot be hurt, for the maggots cannot go from one field to another. The flies may, however, lay their eggs on rye or barley if there is no wheat for them, but they do not noticeably affect other plants. All the fields in a community may be largely damaged if they be sown in early October, while the one field which is not sown until the middle of November will escape injury by the fly in nine years out of ten. *We should say, therefore, that as a general rule wheat should not be sown earlier than the first of November in order to escape injury.* Of course this advice need not apply to sections where the fly does not do damage.

It may be said in objection to this that in some sections November is too late. *In such sections we would advise that the sowing be postponed two or three weeks later than is usually done,* or if this would throw it too late in the season, *then sow just as late as is safe from the heavy frosts.*

2. Turning Under or Burning Stubble.—We have seen that at harvest one brood of the flies is in the pupa (flax-seed) stage. If, therefore, the stubble be turned under *deeply* immediately after harvest, this brood will be very largely destroyed. If the stubble is sufficiently thick and dry, so that the field can be burned over, this will be very effectual.

3. Trap Crop.—A small strip of wheat may be sown earlier than the main crop, for the direct purpose of inducing the flies to deposit eggs upon it, and this may then be plowed under so deeply that any maturing flies would be unable to emerge. To employ this method with the best results, the trap crop should be sown *not later* than the first of October and should be plowed under deeply by the middle of November, the main crop having been sown about the first of November. But it must be emphasized that in using the trap crop the object sought will be partially lost if the trap crop is allowed to stand and mature the flies that infest it; so that if it is to be employed the farmer should surely see to it that it is promptly turned under at the proper season.

Conclusion.—The Hessian Fly will no doubt always continue to be a bad pest, but it will not seem nearly so serious when the methods of controlling it are clearly understood and regularly practiced. Every farmer will recall that the early sown wheat is more often ruined by the fly than that which is sown later. The disposal of the stubble is the next most important means of fighting it, and lastly comes the matter of trap crops.

We venture to predict that every individual farmer who lives in a fly-infested district will prevent more than half the loss usually sustained from the fly if he will carefully follow the directions given in this circular.

Franklin Sherman, Jr.,
Entomologist,
Raleigh, N. C.

Entomological Circular No. 2.

THE COTTON BOLL-WORM (*Heliothis armigera*, Hübn).

INTRODUCTORY.—The Cotton Boll-worm, the corn ear-worm and the tomato fruit-worm are all one and the same species of insect. Cotton, corn and tomatoes are the cultivated plants which are most often seriously hurt by it, although it has also been recorded as injuring tobacco, peas, beans, squash, okra and other plants. The insect is one of very wide distribution, occurring not only throughout the United States and in Canada, but also in Europe, Japan, Australia and doubtless other countries. We will here consider the insect only as a pest of the cotton, mentioning its attacks on other plants only to aid in an understanding of it, to make the matter of remedies more clear.

NOT THE BOLL-WEEVIL.—Much has been said recently regarding the Boll-weevil, which is doing great injury to cotton in eastern Texas. Occasionally, also, there are reports that the "Boll-weevil" has appeared and is doing damage in North Carolina. In most cases the pest has proven to be this Boll-worm, and in no case has the true Boll-weevil been proven to be present. The true Boll-weevil is not at present (October, 1903) known to occur in North Carolina, and while it is probable that it will eventually reach this State, yet it is not likely to do so for several years yet to come. The readers of this circular, therefore, may set themselves at rest upon this point for the present and be assured that the pest under consideration, and of which an excellent illustration is given, is *not* the Boll-weevil.

BOLL-WORM PRESENT EVERY YEAR.—The Boll-worm is present in greater or less numbers every year, although as it feeds on a great variety of plants, it does not do so much damage in some years as in others. For the past twenty years, however, the pest seems to have been gradually gaining in numbers and destructiveness, until now it ranks among the worst insect enemies of the cotton. Yet there is not the least reason to believe that it will ever cause the abandonment of cotton-growing unless it be by those who are too ignorant or too indolent to make use of the methods of controlling it. At the present time its effect upon the crop in average years is not very marked. The insect is probably much more familiar to the reader as the ear-worm of corn, for corn (especially the sweet table varieties) is its favorite food, and it is to be found attacking that plant more regularly than any other.

LIFE-HISTORY AND HABITS.*—The adult (parent) insect is a brownish-yellow moth which measures about an inch and a half from tip to tip of the expanded wings. The moth flies at dusk and after dark, and feeds upon the nectar of flowers. The female moths lay the eggs on the cotton plant, most frequently on the under side of the leaves. These moths do no harm other than to lay the eggs. The eggs hatch in from two days to a week to small dark-colored caterpillars, or *larvæ*, which crawl with a looping motion. At first the young caterpillars feed on the leaves close to the egg-shell, but later they wander farther away and attack the first boll they can find, or bore into the bud. The worm may remain in the boll first attacked until it is completely eaten out, or

*The reader should carefully study the figure while reading this paragraph.

THE COTTON BOLL-WORM.

1. Egg on underside of cotton leaf; 2. Larvæ one-third grown boring into square; 3. Entrance hole of young a in square, with excrement at entrance; 4. Nearly full-grown larva just issued from boll; 5. Full-grown a on leaf-stem; 6. Pupa, shown in center of underground earthen cell; 7, 8, and 9, adult moths.

(After Howard, U. S. Dept. Agr.)

it may eat directly through the boll and at once go in search of another. In this way one Boll-worm may destroy a considerable number of bolls.

When the larva (caterpillar) is fully grown it is from an inch to an inch and a half in length. They vary greatly in color, some being dusky brown, others pink, reddish or yellowish. The grown larva leaves the boll and enters the ground, where it changes to the *pupa* or chrysalis. It passes this stage within an oval cell in the earth. It is of a light-brown color and entirely helpless, as this is merely a transformation stage, when the larva is being formed into the adult moth. This stage of the insect lasts from one to four weeks (sometimes over winter), at the end of which time the adult insect emerges. The adult insects mate and deposit eggs for another brood, and then die.

Larvæ Eat Each Other.—It is interesting to note that the larvæ are cannibals and not infrequently eat one another. This is (to us) a very beneficial habit and worthy of all possible encouragement, but of course it only takes place when they are numerous enough to come into close competition with one another for the possession of food, so that there may always be enough left to do serious damage.

Method of Passing the Winter.—The winter is usually passed in the pupa state, underground; but in warm climates, and probably throughout the eastern section of North Carolina, the adult moths may live over winter in sheltered situations. We have every reason to believe that many adult moths passed the winter of 1901-'02 in the vicinity of Maxton in Robeson County.

Several Broods Each Year.—There are several generations of the insect each year, the exact number having never yet been definitely determined. It is likely that there are more distinct broods in the eastern section of this State than in the middle region, and likewise it is probable that there are more broods in the middle region than in the high mountain localities. It seems probable that it will be eventually proven that there are in eastern North Carolina at least five distinct broods, in the piedmont section four or five, and in the mountain region not more than three or four.

The fact that some of the adult moths pass the winter makes it impossible to sharply separate the different broods, for the worms from the eggs of these wintering moths appear early in the spring, attacking the earliest sweet corn, while only a week or so later there appears the progeny of those that passed the winter in the pupa state, thus mixing the broods so that a definite separation is extremely difficult. In corroboration of this we may mention that on May 31, 1902, we found adult moths and larvæ of all stages of growth in a field of sweet corn at Maxton, Robeson County.

Damages Cotton Late in Season.—As the tender ear of corn is the favorite food of this insect, they are most abundant on that plant so long as the ears are tender enough to be readily eaten. Sweet table varieties of corn are especially subject to attack. Hence it is that all through the early part of the season cotton is not noticeably affected as a rule. After the corn kernels have become hard, however, the moths begin to lay their eggs on the cotton, and the larvæ eat into the bolls. How we can make use of this fondness for corn will be shown a little later. We receive each year some reports of damage to cotton by this insect, but they always come late in the season, while reports of its damage to corn and tomatoes come early in the summer. In the past three years the earliest report of injury to cotton was made on August 6th

(1903) by Mr. A. A. Ray of Rockfish, Cumberland County, and the latest such report was on November 8th (1901) by Mr. S. N. Alexander of Shamrock, Mecklenburg County. The present season is not yet finished.

REMEDIES.

General.—As the insect feeds on the inside of the boll, it is practically impossible to apply any effectual remedy after the cotton has become affected. Our efforts, therefore, must be to find some effectual means of preventing their first entrance into the bolls. There are two methods which may be used to accomplish this, both of which are effectual to a certain degree, but neither of which is perfect. The first of these is generally regarded as the most satisfactory, although the two methods may be combined with even better results.

1. Trap Crop of Corn.—We have said that corn, especially the sweet varieties, is the favorite food of the worms. It is therefore possible to tempt them away from the cotton by having corn close by which is in tender ear from the time the cotton blooms until the bolls begin to open. The most advisable method of managing this is to leave vacant strips of five rows for every 25 rows of cotton that are planted. In these vacant strips, at the earliest possible time, plant one row with an early-maturing sweet corn. It should not be planted too thickly, as the smallest practicable number of stalks and ears is desired. During the period while the corn is in silk frequent careful examinations must be made, and as soon as no more of the eggs are found on the silk, or when the ears have become thoroughly infested and before the worms are fully grown within them, the silk end of the ear may be cut off and fed to stock or burned to destroy the worms. Three more rows should be planted in corn at such a time that it will be in silk about the first of July or a little later. Many eggs will be laid on these and the worms will be so numerous that many of them will eat each other. Besides, there are a number of extremely small wasp-like insects, called *parasites*, which destroy considerable numbers of the eggs and larvæ. These will increase greatly when the worms become numerous in these rows. Therefore it will be well to do nothing to check the worms in the three rows, *but* the fifth and last row should be planted in corn at such a time that it will be in full silk about the first of August. The moths which mature from the three undisturbed rows will lay eggs on this fifth row, and this should be carefully watched and the ears destroyed as soon as it appears that no more eggs are being laid and before the worms become mature. The three rows will be likely to yield enough in grain and fodder to pay for themselves, aside from their value in keeping the worms from the cotton.*

2. Poisoning the Worms.—It has been stated that when the eggs are laid on the cotton, the young larvæ feed at first on the leaves. Hence, if the foliage be thoroughly poisoned with Paris green at the proper season, a number of the young worms will be killed. In order to do this with best success, the poison should be applied about the last of July. The green may be mixed with flour at the rate of one pound of green to four pounds of flour, thoroughly sifted together and shaken on the plants from a coarse sack. This method, however, is only partially effective and is not to be recommended nearly so strongly as that of trapping the worms with corn.

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*The details of this method as here given are taken largely from Farmer's Bulletin No. 47, U. S. Dept. of Agr., by Dr. L. O. Howard.

CONCLUSION.—The Boll-worm is present every year, but is more destructive in some years than in others. It is not likely that it will ever cause the abandonment of cotton-growing, as some have predicted, and it may be kept within a fair degree of control by the use of corn as a trap crop. It is not the same insect as the Boll-weevil, and the Boll-weevil is not at this time known to occur in North Carolina. It is the same insect that is so frequently found in the ears of corn, and often also eats into the fruit of tomatoes.

FRANKLIN SHERMAN, JR.,
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Entomological Circular No. 3.

THE ROUND-HEADED APPLE-TREE BORER.

(*Saperda candida.* Babr.).

Introductory.—The Round-headed Apple-tree Borer does considerable damage to young apple trees in the western part of North Carolina, but is not, so far as we know, destructive in the eastern section. Our records show that it is destructive in Stokes, Wilkes, Watauga, Buncombe, Haywood, Macon and Jackson counties. This circular, therefore, will be of special use to the apple growers in the western region, and those who are located in the eastern half of the State will need to give but slight attention to it, except that it might be of interest for growers all through the piedmont section to make an inspection to see if the insect is destructive in their orchards. In this way we may get exact information upon the distribution of the insect in this State. If any one observes this insect anywhere to the east of Rockingham and Catawba counties we shall be glad to have it reported to us, together with specimens, to show the absolute accuracy of the observations.

General Description.—The form which does the actual injury is a whitish grub, attaining a length of a little more than an inch, and which bores into the trunk at the surface of the ground, often girdling and killing the tree. The grub has a somewhat (but not greatly) flattened head and strong black jaws. (See Fig. 1, *a.*)

Life-history and Habits.*—The insect is a native of America and is very destructive to apple orchards throughout the Northern States. It is also known to attack wild crab-apple, pear, quince and mountain ash. As before stated, its injuries in North Carolina seem to be confined to the western part of the State.

The adult (parent) insect is a cinnamon-brown beetle, about an inch long, with a conspicuous white stripe down each side of the middle of the back. The antennæ ("horns" or "feelers") are nearly as long as the body. The beetles lay their eggs on the bark, near the surface of the ground, during the summer. The beetles themselves do no harm other than laying the eggs, and when that is done they die.

The eggs hatch into small white grubs, which bore within the bark and sap-wood, and their castings are forced back into the burrow behind them. The presence of the pest is often most readily detected by carefully looking for this brown "sawdust" as it oozes out through some crack or hole in the bark where the larva is at work.

It is supposed that it takes three years for the larva to reach maturity, but for at least the first half of their lives the larvæ live in the inner bark and sap-wood; then they burrow deeper into the solid wood, where they are more secure from the attacks of their enemies, and likewise from man.

When full grown the larva burrows upward and outward to the bark, then returns to the bottom of the burrow, and partially or entirely fills the upper part with castings or strips of wood. Then, in the bottom of the burrow, it turns to the *pupa* (Fig. 1, *b*), in which stage it is helpless and is only protected

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*The reader should consult the figure while reading this paragraph so as to learn to distinguish the insect in the different stages of its existence.

by being so snugly hidden away in the deep burrow. This change to the pupa stage takes place in winter or spring, and the adult beetle then emerges in May or June.

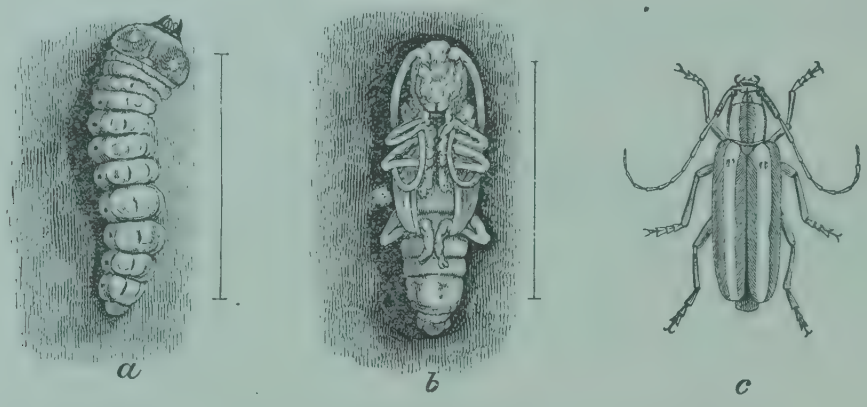

FIG. 1.—THE ROUND-HEADED APPLE-TREE BORER.

a—grub, or larva; *b*—pupa; and *c*—adult female beetle. The male adult beetle is more narrow than the female.

(After Riley).

ALSO ATTACKS BRANCHES.—The insect sometimes attacks the branches of the apple, and we have taken four or five larvæ from a section of a branch not more than a foot in length. But this is unusual, and its attacks are more general and more severe at the surface of the ground.

Another insect, known as the Flat-headed Apple-tree Borer, is commonly found attacking the branches and trunk of the apple above the ground, and this pest is well known to be destructive in eastern and middle North Carolina. But the Flat-headed Borer is entirely different from this Round-headed Borer which we are now considering.

REMEDIES.

DIGGING OUT THE LARVÆ.—When a tree is found to be infested by this borer the larva should at once be dug out and destroyed. This may be done with a jack-knife, aided with a stout wire for probing into the burrows. An orchard should be examined once or twice each year to ascertain whether these pests are present, every tree being carefully examined at the base to see if the castings or "sawdust" can be detected. Any time during the late fall and winter is favorable for this work, but if the orchard is in a locality where long, hard freezes are usual the work should be done before the coldest weather comes, for it is often necessary to remove earth from the bases of the trees in examining and worming them, and this cannot well be done when the earth is frozen. The present month (December) is a good time to attend to this, and every owner of an orchard, especially if the trees be under six or eight years of age, should attend to this matter at once after reading this circular.

MOUNDING THE TREES.—By mounding the earth against the base of the trees at the proper season to a height of six or eight inches the beetles will be forced to lay the eggs higher on the trunk, so that the larvæ can be more easily reached when the trees are wormed. The mounding should be done in late winter, the trees having been previously wormed. The mound is allowed to remain throughout the spring, summer and early fall, so that the adult beetles will deposit their eggs at the top of it.

In late fall—say during November—the mound is removed, together with the earth to a depth of an inch or two below the normal surface. The trees are allowed to remain in this condition until wormed in the fall or winter, when the mound is again replaced. The work of mounding may be easily done with a hoe.

Note.—If the soil is of such a nature that it will hold water the earth should not be removed from the base of the tree below the normal level of the earth, since the water would be held in the hollow and the freezing of winter would work injury to the trees. Nor should a hollow be left at the base in a locality where it is subject to high winds, since in that case the tree might become loosened. Having a slight hollow at the base of the tree in winter is of some advantage by exposing the larvæ fully to the freezing and thawing, but it should *not* be practiced if the trees are so exposed as to be injured by it.

The *mounding*, however, is entirely beneficial and should by all means be practiced, and if a hollow cannot be safely made at the base of the tree in winter the mound should simply be removed to the normal level of the soil.

Protectors.—Various devices have from time to time been placed upon the market for protecting the trees by preventing the laying of the eggs. We think that the best form of protection consists in covering the base and lower portion of the trunk with wire mosquito netting. Cotton may be placed between the netting and the trunk at the top and the netting then drawn in snugly, so that there shall not be a crevice through which the beetle can get inside. The netting itself should not touch the trunk at any point, and at the bottom it should be put below the surface by banking a little earth against it. The netting need not extend more than fifteen or eighteen inches up the trunk. Such a protection is quite inexpensive, as four or six pieces of sufficient size for young trees (three to eight years) can be cut from one square yard of netting. This method will also furnish a good protection from mice, rats and rabbits.

Paints, etc.—Tar has been used to prevent the laying of the eggs by keeping the lower part of the trunks smeared during the egg-laying season—June to August. Axle grease has likewise been recommended, as has also a mixture in equal parts of white lead and linseed oil. But each grower should carefully test these substances for himself on a few trees before adopting them fully, for it is contended by some growers that they are liable to hurt the trees.

Conclusion.—The remedies which we most strongly recommend for the Round-headed Apple-tree Borer are: *First.* Thorough worming of all affected trees and inspection of the trees once or twice between November and April. *Second.* Mounding of the trees, so that the eggs will be laid higher on the trunks, so the larvæ may be more easily reached. *Third.* Protection of the trees by wire netting. The application of such substances as paint, tar and axle grease should first be tested carefully by the grower before making any general use of them.

Franklin Sherman, Jr.,
Entomologist, Dept. of Agr.,
RALEIGH, N. C.

SPRAYING APPARATUS.

By Franklin Sherman, Jr., Entomologist.

Introductory.—Spraying is absolutely essential in order to grow fruits and vegetables to advantage. There are very few farms where it would not pay to have a spray pump, and there are very few farmers who could not afford to have one. Any one who grows fruits and vegetables, if only for home use, should have a good sprayer of some sort. One season of intelligent use will more than repay the cost of the apparatus, while the pump, if kept clean and properly cared for, should last for several years. Persons growing fruits and truck for market cannot hope to keep fungous and insect pests in check by any other means. It is just as essential to spray as it is to cultivate, that is, if you want to protect the crop. Of course if you are willing to do without apples, to have the potato vines eaten up by beetles, to have the tobacco-worms and flea-beetles destroy the tobacco, to have the scale-insects and caterpillars kill the fruit trees, to have the cotton ruined by lice, to have the lice and worms destroy the cabbage, to have the cluster grapes rot on the vines, etc., then you need not get a pump, and you need not be surprised to see your efforts come to naught. Neither need you expect us to recommend remedies which can be applied otherwise, for by spraying we are able to apply insecticides in the cheapest, most effective, and most economical manner yet discovered.

How to Select Your Pump.—Now we want it distinctly understood that we do not, and cannot, recommend any one kind of pump as being the best. There is no best pump. The different types are suitable to different uses. Neither is there any one firm which makes better pumps than others. There are a large number of firms all making first-class apparatus, and we have not tested or even seen all of them.

The proper way to select your pump, therefore, will be to carefully read over this circular and come to some decision as to what kind, or kinds, of sprayers you want. Then write to each of the firms given in the list on page 8 and ask them to send you their catalogues of spraying apparatus. Then, after a careful study of the different makes, etc., decide which one you want and order accordingly.

Be sure to get plenty of hose (see later paragraph on this subject) and specify the kind of nozzle (see later paragraph) that you prefer. If you will be spraying fruit trees, an extension rod with stop-cock will be a desirable feature.

It is *not* economy to buy a poor pump simply because it is cheap. Get the very best apparatus you can that is properly adapted to the work you have to do.

Require Care.—It is easy to so abuse a good pump that it will be worthless after the use of one or two seasons. It should therefore be well taken care of. At the end of the season the pump should be thoroughly washed out with clear water and rubbed dry. Sediment from spraying mixtures which

may have settled on the pump should be removed as far as possible, and the pump should be stored away in some convenient place under cover. Keep working parts oiled.

Uses of Spray Pump.—Often a pump may be in almost continual use throughout the year, without regard to season. If the trees are infested with the San José Scale, winter will be the usual time for spraying to kill it, while spring and summer are the seasons when work is commonly done against various caterpillars and insects on truck and garden crops.

Spray pumps may also be used for other purposes, as spraying stables and chicken-coops for lice, washing buggies, whitewashing, etc.

KINDS OF PUMPS.

By carefully reading the discussion of the different kinds of spray pumps, each farmer should be able to decide (better than we can decide for him) just what kind of apparatus he wants.

Bucket Pumps.—These are the cheapest and most simple of the serviceable spray pumps. They are so made that they can be placed in a bucket with the mixture and the whole carried about from place to place, and set down wherever it is desired to use them. There is a foot-rest outside and by placing the foot on it the pump is held steady while being operated. Some of these are furnished with a clamp with which they are attached to the bucket.

Bucket pumps are good for limited use, as for experimental purposes or for use on a few trees or vines. Their principal disadvantage lies in the fact that

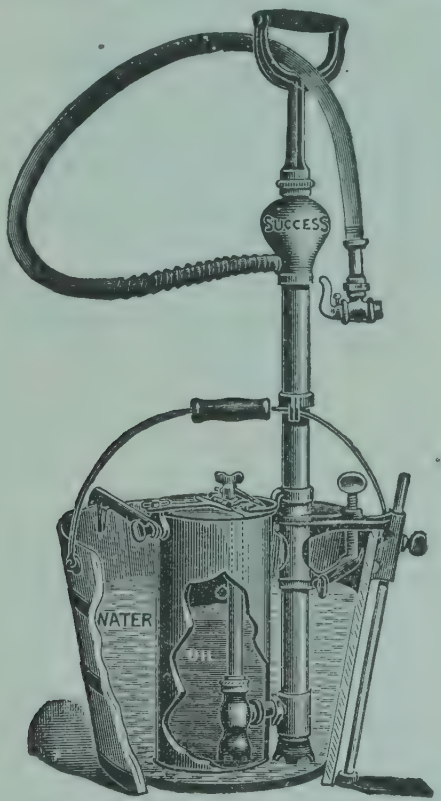

Fig. 1.—BUCKET PUMP WITH TANK FOR OIL.
(From The Deming Co.)

they are carried about by hand and have to be set down at each separate place where there is work to be done.

For the man with a small orchard, and for the man who cannot spend much for a pump, these are the most useful. They are also just the thing for the

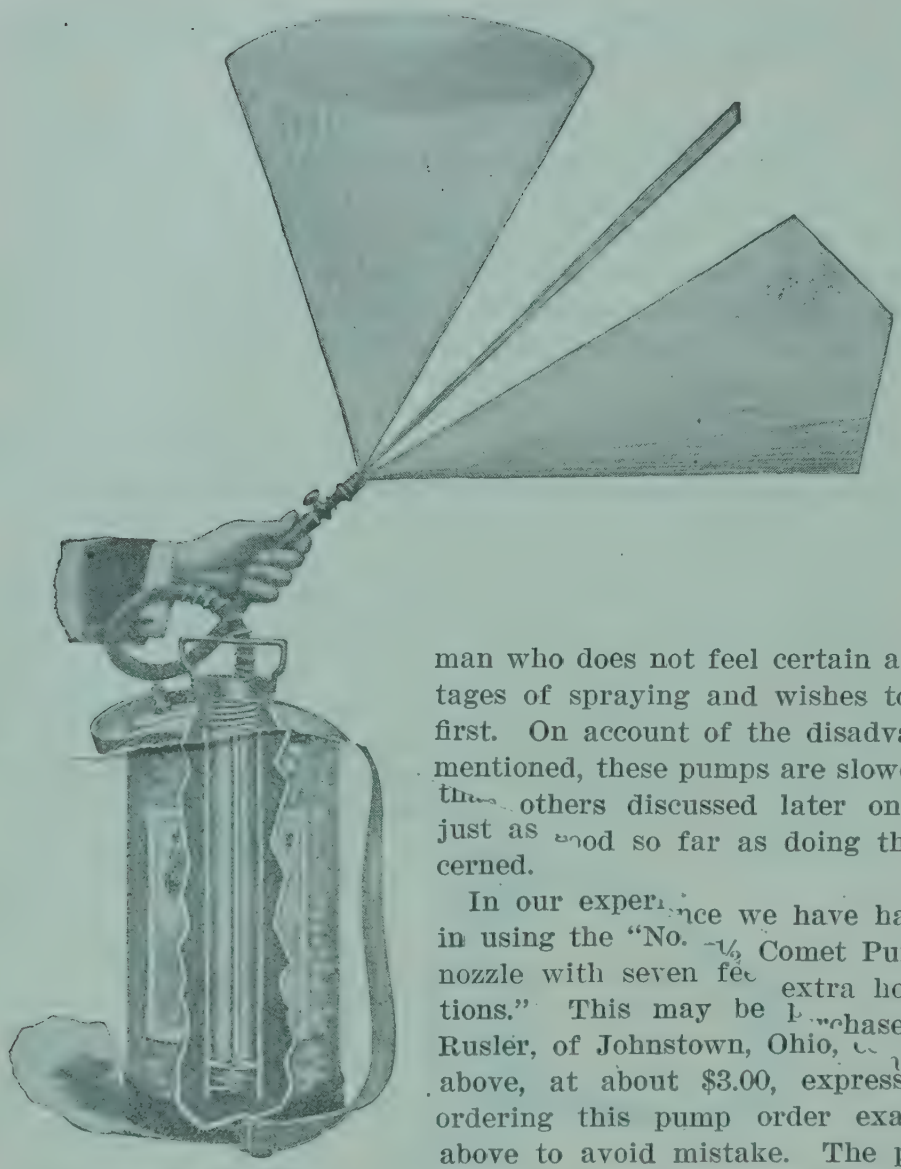

FIG. 2.—A COMPRESSED AIR SPRAYER.
(From Rochester Spray Pump Co.)

man who does not feel certain about the advantages of spraying and wishes to give it a test first. On account of the disadvantages already mentioned, these pumps are slower to work with than others discussed later on, but they are just as good so far as doing the work is concerned.

In our experience we have had good success in using the "No. 1½ Comet Pump with Gemel nozzle with seven feet extra hose and connections." This may be purchased from H. B. Rusler, of Johnstown, Ohio, complete as quoted above, at about $3.00, express extra. In ordering this pump order exactly as quoted above to avoid mistake. The price of various bucket pumps, with nozzle and hose complete, ranges from $3 to $7.

COMPRESSED AIR SPRAYERS.—These are so made that the pump fits into an air-tight can which is partly filled with the spraying mixture. By pumping the air in the tank is placed under pressure and this forces out the spray automatically for several minutes. These have proven highly popular with some growers, especially for use on tobacco and other low-growing crops. It should be said, however, that they do not, in our experience, throw so strong, fine, and penetrating a spray as those which are worked by hand.

The Rochester Spray Pump Company, of Rochester, N. Y., has sold many of its pumps of this type in this State and they have generally given satisfaction. They are fitted with the "Kant-klog" nozzle, which is capable of many different adjustments. The E. C. Brown Company, Rochester, N. Y., also offers a pump of this sort. Compressed air sprayers usually cost from $4 to $7.

KNAPSACK PUMPS.—These are the pumps that are most desirable for general garden use, and in spraying such low-growing plants as potatoes, beans, peas, melons and other truck crops, as well as grapes. Orchard

trees may also be treated with them. With these the pump and receptacle for carrying the mixture are combined in one piece of machinery, and the whole is fitted to be carried on the back, straps passing over the shoulders and under the arms. The pump handle hangs down in front of the operator.

We consider these to be by far the best all-round apparatus for general work on the farm, and in the garden and orchard. If they have any special disadvantage it is in spraying tall fruit trees where the operator has to stand perfectly erect with the head turned upward. In such a position the weight of the pump and materials on the back is apt to give some difficulty in maintaining balance. But this objection can be overcome by use of a step-ladder or by moving about to find more advantageous positions from which to spray the higher parts of the trees. They are not suitable for very large orchards, unless the trees are low and more than one pump is in use, but any one with an orchard of 500 bearing trees or less will find them useful.

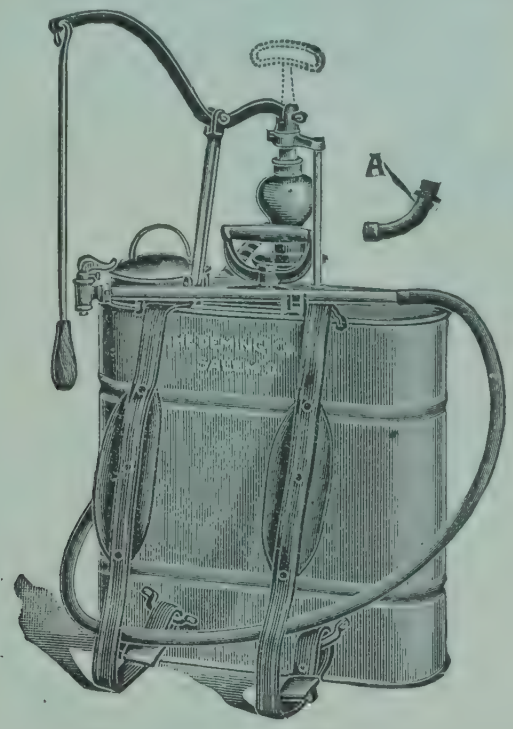

FIG. 3.—KNAPSACK PUMP, SHOWING BENT-NECK ATTACHMENT AT "A."
(The Deming Co.)

In our experience we have found the "Success Knapsack Sprayer" to be very satisfactory. This is made by the Deming Company of Salem, Ohio, and is sold by the Sydnor Pump and Well Company of Richmond, Va., from whom it should be ordered. In making this order ask for "Success Knapsack Sprayer, with seven feet extra section of hose and connections, and bent-neck attachment for under-spraying, on extension pipe with Vermorel nozzle." The bent-neck attachment, which is shown in the illustration of these pumps, is extremely useful in spraying the under surface of the leaves of such plants as cotton, melons, etc. The outfit complete as mentioned above costs about $18.00, freight or expressage extra. The price of various knapsack pumps ranges from $10 to $20.

BARREL PUMPS.—The barrel pumps are larger and stronger than the bucket or knapsack pumps and are mounted in strong barrels or tanks, so they can be placed in a wagon or cart and drawn by horses. These are the most useful in large orchards, say of 500 trees or more.

We find that Goulds "Pomona" Pump gives good satisfaction. This may be either mounted upright in a barrel, as shown in the figure, or it may be mounted so that the barrel lies on the side in a bed made for it. Barrel pumps may also be fitted so that there shall be two leads of hose, or only one; the former is suited for faster work. The cart with the pump and barrel is driven along between the rows, and by having long lengths of hose the men who are operating the nozzles can walk around so as to reach all parts of the trees on either side. If it is intended to thus spray two whole rows at a time while driving along one middle, each pipe should be at least thirty feet long.

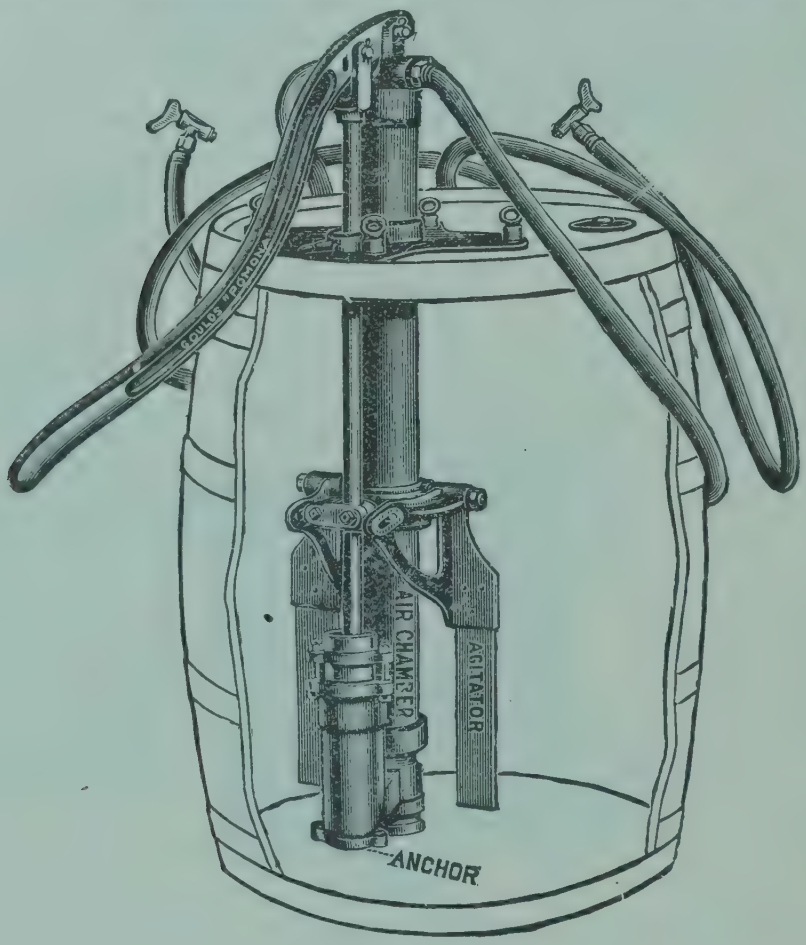

FIG. 4.—BARREL PUMP.
(Goulds Manufacturing Co.)

FIELD SPRAYERS.—These are fitted with barrel or tank and several nozzles attached at the hind end of the wagon or cart, so that several rows of potatoes, strawberries, or other similar crops may be sprayed at once. Some are made adjustable so that longer hose can be attached and the pumps worked by hand, thus making a good orchard sprayer.

The Field Sprayers are often geared so as to work automatically, the turning of the wheels working the pump. Pumps of this kind are especially recommended for the extensive potato and strawberry growers in the eastern part of this State. The Watson 4-row Potato Sprayer, which is shown in the illustration, may be bought of Mr. Percy L. Banks, Norfolk, Va., who is agent for the Danforth Company.

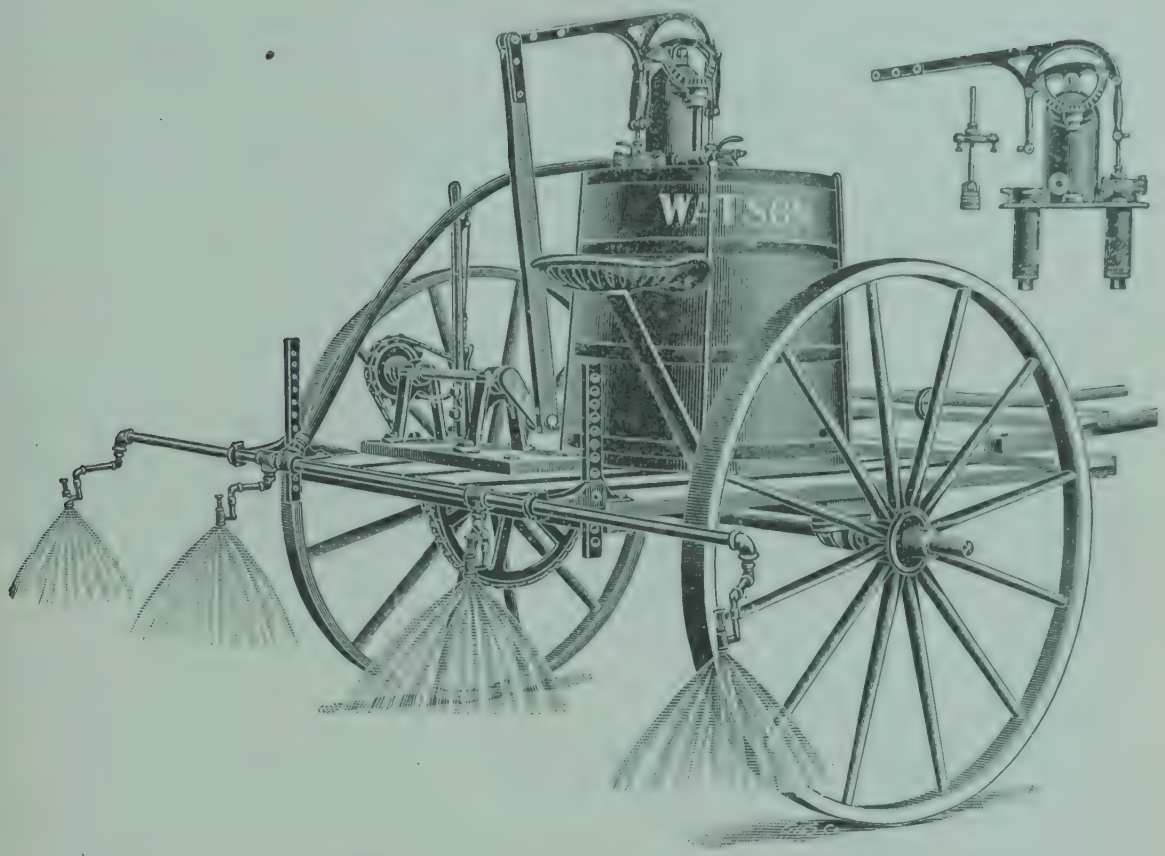

FIG. 5.—FIELD SPRAYER. THE WATSON FOUR-ROW POTATO SPRAYER.
(From The Danforth Co.)

HOSE.—The hose through which the spraying material is conducted will rot or wear out in time and should be replaced by new hose when needed. Order the hose from the same place where you purchased the pump; state the kind of pump you have and the size of the hose, and length desired, so they will send just what you want. Hose can be purchased at about 20 cents per foot. As a rule only about four feet of hose is furnished with a pump, but for most practical purposes more is needed, and should be ordered with the pump. Notice that in two cases we have recommended that seven feet extra hose be ordered. This would give about twelve feet in all, enough to enable one to spray most fruit trees. For the large barrel pumps longer hose is required.

NOZZLES.—The nozzles fit on the end of the hose and regulate the fineness of the spray that is thrown. Some dealers make nozzles of their own pattern, but in general there are two types which are in favor. These are the "Vermorel" and the "Bordeaux" nozzles. The former throws a cone-shaped spray, while that of the latter is flat, or fan-shaped. Both of these types are good and the grower may take his choice. It will do no harm to have one nozzle of each kind, so that you may come to your own decision as to which you like best. Nozzles cost about $1 each.

AUTOMATIC AGITATORS.—Spraying mixtures must be kept stirred or the ingredients are likely to settle or separate. Some pumps are furnished with devices which automatically stir the mixture. Such a device is very useful and should be taken into consideration in ordering.

KEROSENE PUMPS.—A mixture of kerosene and water is used for combating many insects, such as plant-lice, scale-insects, etc. Oil and water do not mix

readily, and some dealers have pumps so constructed as to make a fine mechanical mixture of the oil and water. These are provided with a separate tank for oil. One of these is shown in Fig. 1.

While these pumps do away with the necessity of making the kerosene emulsion by hand, yet they are not entirely reliable, and not infrequently they get so out of order that they either throw so little oil as not to kill the insects, or so much as to kill the trees. We therefore recommend that the orchardist do not purchase these kerosene pumps, but make up his emulsion by hand when it is needed.

DEALERS.—Before ordering a pump get catalogues from the following firms. They are all reliable and their catalogues will give you some further details about pumps which cannot be gone into here. These catalogues also frequently contain much valuable information about spraying. But keep in mind all the points brought out in this circular in making your selection. Ask definitely for their catalogues on "Spraying Apparatus," otherwise you may get a catalogue on well drills, steam pumps, etc.

Here is the list:

Goulds Mfg. Co., Seneca Falls, N. Y.
J. F. Gaylord, Catskill, N. Y.
Field Force Pump Co., Elmira, N. Y.
Sydnor Pump and Well Co., Richmond, Va.
Morrell & Morley, Benton Harbor, Mich.
H. B. Rusler, Johnstown, Ohio.
Deming Co., Salem, Ohio.
E. C. Brown Co., Rochester, N. Y.
Wm. Stahl, Quincy, Ill.
Rochester Spray Pump Co., Rochester, N. Y.

Entomological Circular No. 5.

LIME, SULPHUR AND SALT WASH FOR SAN JOSE SCALE.

By Franklin Sherman, Jr., Entomologist.

Introductory.—The Lime, Sulphur and Salt wash has long been in use on the Pacific coast as a remedy for various scale-insects. The first trials of it in the east were made to control the San José Scale, but the results were so unsatisfactory that it was abandoned and not until recently have renewed efforts been made to use it as a remedy for this pest. It now seems to be fully demonstrated, both in this State and the other eastern and southern States, that this remedy is, if anything, more effectual in killing the scale, and that, on the other hand, it is less harmful to the trees than the various washes of soaps and oils that have heretofore been used. We therefore now recommend this wash fully to our growers who have the San José Scale on their trees, as the most promising remedy yet found, and also as a much cheaper and safer wash than the remedies which we have heretofore recommended. We commend this circular to the careful study of those who have this pest to combat.

A Difference in Formulas.—There is quite a variation in the formulas recommended by the various entomologists, and in order that our growers may compare them, and see how our recommended formula compares with others, we give herewith a table which shows the strengths advised in various other eastern States, all reduced to one standard amount of wash:

State.	Lime.	Sulphur.	Salt.	Water to Make.
Georgia	30 lbs.	20 lbs.	15 lbs.	60 gals.
Maryland	40 "	20 "	15 "	60 "
Virginia	18 "	18 "	6 "	60 "
Tennessee	18 "	18 "	18 "	60 "

Those who are familiar with spraying operations will not be surprised at the differences in the formulas as above shown, for it is well understood that there is still a considerable variation in the formulas used in making Bordeaux Mixture—some preferring one strength and some another. It will be observed, however, that the formulas are all closely similar in one respect and that is that approximately one pound of sulphur is used for each three gallons of the wash, and as the sulphur is the principal ingredient, the other differences are not essential.

Use of the Wash in North Carolina.—A year ago personal letters were written from this office to several of our most prominent growers advising the use of this wash during that winter (1902-'03). Unfortunately we are not now able to state the formula then recommended, but believe that it was the

same as that recommended in Georgia. No general recommendation of the material was then made, as it was desired to await the result of tests both in this and neighboring States. As we have ourselves been unable to conduct the tests that were desired, it is deemed advisable to bring together in this circular the more essential points brought out by experiments in other States as well as such experiments as have thus far been made in this State, and to place before our growers the formula which, from the data at hand, seems to be best suited for their needs.

Two years ago Mr. George N. Ives of New Bern made an attempt to use this wash in his extensive orchards at Newport, but as no sulphur was available at his place at the time the test was made, a mixture was made composed of only the lime and salt in water. This was therefore essentially a whitewash, as the sulphur (which is the most important ingredient) was omitted. The test was made and the result was unsatisfactory. It must be observed that this was *not* a true test of the Lime-Sulphur-Salt wash.

Mr. A. Gunther, of Vass, Moore County, used this wash in the spring of 1903. The formula which he used was in the proportion of: Lime, 17 pounds; Sulphur, 17 pounds; Salt, 17 pounds, with water to make 50 gallons of wash. This treatment was supplemented by the application of kerosene emulsion. On November 30, 1903, Mr. Gunther wrote that he "has practically no scale," and an examination by the writer on January 7th, this year (1904), fully confirms Mr. Gunther's claim. Without a doubt the treatment was eminently successful, as very few living scales could be found, although the trees have not been treated since spring of 1903. Mr. Gunther will soon give them another treatment to keep the scale reduced as much as possible.

During the winter of 1902-'03 Mr. J. D. Sayer of Leavitt, Cumberland County, also used this wash. His formula was: Lime, 30 pounds; sulphur, 10 pounds; salt, 10 pounds, and water to make a barrel in all (50 gallons). He also added 1 pound of concentrated lye. It will be noticed that this was made weaker than the strengths generally recommended, as there was only 10 pounds sulphur to about 50 gallons wash. Mr. Sayer states that this winter he will use at strength of 15 pounds sulphur and 2 pounds lye to same quantity of other ingredients. Mr. Sayer boiled his wash by the use of hot irons. He reports satisfactory results, and an examination by the writer on January 6th, this year (1904), showed that the application was very successful.

Mr. Eugene Vander Meersch, of Pine Bluff, Moore County, used this wash in the spring of 1903. The formula which he used was: Lime, 23 pounds; Sulphur, 15 pounds; Salt, 12 pounds, with water to make 50 gallons of the wash. The treatment was very successful. In a letter dated December 23, 1903, Mr. Meersch says: "All the new wood made last summer is practically free from the insect, and on the wood that was covered at the time the wash was applied the scales have come off in patches, showing the bark in sound condition. Where the scale still remains one can see by scraping that the insects are dead—that is, for the larger portion." Mr. Meersch's place was visited by the writer on January 6th, this year (1904), and examination showed that the wash had been a success.

Other growers may have used this wash, but we have not had correspondence with them. At the time this circular is going to press the wash is being applied to a large orchard of 25,000 peach and plum trees at Southern Pines, with every prospect of successful results.

Those who have already used this wash are much encouraged, and they, as well as some who have only combated the scale by the use of kerosene emulsions, are planting trees to enlarge their orchards, feeling fully convinced that the scale can be held sufficiently in check to render their orchards profitable. They entertain no idea of exterminating the scale, but expect to fight it from year to year.

LYE, BLUESTONE, ETC., NOT NEEDED.—In a bulletin (No. 141) of the Virginia Experiment Station, entitled "The Lime-Sulphur Wash," Professor William B. Alwood gives a comprehensive review of tests made of this wash at that station. These tests showed that where concentrated lye was added to the wash the results were not noticeably better than when omitted, even when used at the rate of 12½ pounds to 100 gallons of the wash. His tests further show that bluestone seems to have a decidedly detrimental effect on the wash. In the present state of our knowledge, therefore, it would seem unwise to use any other ingredients in making this mixture than the lime, sulphur and salt.

WHAT FORMULA SHALL BE USED?

It has been pointed out that while the formulas heretofore recommended differ in some particulars, yet they are not materially at variance in the essential features. In making out the following formulas for our growers we have kept these points well in mind, and our recommendations are not materially different from the others, but we give the amounts necessary for making the wash in 10, 25, 50 or 100 gallon quantities, according as the treatment is to be applied to a few trees or to a large number:

To make 10 gallons of the Wash use 3½ pounds Stone Lime, 3¼ pounds Sulphur, and 2 pounds Salt.

To make 25 gallons of the Wash use 8¾ pounds Stone Lime, 8¼ pounds Sulphur, and 5 pounds Salt.

To make 50 gallons of the Wash use 17½ pounds Stone Lime, 16½ pounds Sulphur, and 10 pounds Salt.

To make 100 gallons of the Wash use 35 pounds Stone Lime, 33 pounds Sulphur, and 20 pounds Salt.

DIRECTIONS FOR PREPARING THE WASH.

Having decided upon the amount of the wash you will need, and having put out the necessary quantities as just indicated in this circular, proceed as follows:

TO MAKE THE TEN-GALLON QUANTITY.—Put 1 gallon of hot water in an iron kettle which will hold at least 4 gallons. Add the 3½ pounds lime and stir with wooden paddle to aid slaking. When in full process of slaking add the 3¼ pounds sulphur which has been mixed with a little water to form a thin paste. (Any lumps in the sulphur must be crushed before it is put in.) Add enough water to bring the whole to a paste, and stir together thoroughly. Now add water enough to make 2½ gallons. (It is best to use hot water, so that the mixture is kept hot all the time, but cold water may be used if hot is not convenient.) While this is hot add the 2 pounds salt and boil the whole for three-fourths of an hour or an hour, and to thoroughly dissolve all the ingredients keep stirring occasionally. Now pour out the mixture into a clean keg or other receptacle, straining it through a fine wire netting, to remove all trash and sediment. Add hot water to make the 10 gallons, stir thoroughly and the mixture is ready for use.

To Make the Twenty-five-gallon Quantity.—Put 2½ gallons of hot water in an iron kettle holding at least 10 gallons. Add the 8¾ pounds lime and stir with paddle to aid slaking. When in full process of slaking add the 8¼ pounds sulphur which has been mixed with water enough to form a thin paste. (Any lumps in the sulphur must be crushed before it is put in.) Add water enough to bring the whole to a paste and stir together thoroughly. Now add water to make 8 gallons. (It is best to use hot water, so that the mixture is kept hot all the time, but cold water may be used if hot is not convenient.) While this is hot add the 5 pounds of salt, and boil the whole for from forty-five minutes to an hour, stirring often, to thoroughly dissolve all the ingredients. Now pour out the mixture into a clean barrel or other receptacle (or into the tank of the pump), straining it through a fine wire netting to remove all trash and sediment. Add hot water to make the 25 gallons, stir thoroughly and the wash is ready for use.

To Make the Fifty-gallon Quantity.—Put 4 or 5 gallons of hot water in an iron kettle of at least 20 gallons capacity. Add the 17½ pounds lime and stir to aid slaking. While in full process of slaking add the 16½ pounds sulphur which has been mixed with water enough to form a thin paste. (Any lumps in the sulphur must be crushed before it is put in.) Add water enough to bring the whole to a paste, and stir together thoroughly. Add water to make 12 gallons. (It is best to use hot water, so that the mixture is kept hot all the time, but cold water may be used if hot is not convenient.) While this is hot add the 10 pounds salt and boil the whole for three-fourths of an hour or an hour, stirring often, to thoroughly dissolve all the ingredients. Now pour out the mixture into a clean barrel or tank, straining it through a fine wire netting or sieve to remove all trash or coarse sediment. Add hot water to make the 50 gallons, stir thoroughly and the wash is ready for use.

To Make the 100-gallon Quantity.—Place 10 or 12 gallons of hot water in a tank or boiler of at least 40 gallons capacity. Add the 35 pounds lime and stir to aid slaking. While the process of slaking is most active add the 33 pounds sulphur which has been mixed with water enough to form a thin paste. (Any lumps in the sulphur must be crushed before it is put in.) Add water enough to bring the whole to a paste, and stir together thoroughly. Add water to make 25 gallons. (It is best to use hot water, so that the mixture will be kept hot all the time, but cold water may be used if hot is not convenient.) While this is hot add the 20 pounds salt, and boil the whole for an hour or an hour and a half, stirring often, so that all the ingredients shall be thoroughly dissolved. Now pour out the mixture as needed, adding water in the proper proportions to make 100 gallons in all, straining it through a fine wire strainer or sieve to remove all sediment and trash.

Apply While Warm.—The wash should be applied before it gets cold. It is best to spray it on the trees soon after being made, although not while boiling hot. Where it is made up in so large quantities that it gets cold before the last can be sprayed, it may be reheated by the use of hot irons.

Equipment Needed in Making Wash.—From the directions which have already been given for preparing the mixture it will be seen that at least two kettles should be had in making even small quantities of the wash, and these should be at least as large as indicated in the directions. It is also best to have one larger kettle or boiler in which is kept a constant supply of hot water for use in the preparation. There should also be at least one clean keg or barrel into which the mixture can be poured as it is prepared.

For use on a large scale it is well to have large tanks and a steam boiler, so that the work may be done rapidly and thoroughly. But for making the wash in smaller quantities kettles will do, provided they are large enough. There should be at least one stout wooden paddle for stirring each kettle, and it will also be well to have one or two large long-handled iron dippers for handling the wash.

Iron Utensils.—The utensils used in boiling the wash should be of iron. The wash has a corrosive (dissolving or eating) effect on brass or copper.

Care of Pumps.—Ordinary spray pumps may be used in applying this wash, but they should be *thoroughly* washed out with clean water after each day's use.

Cautions to be Observed.—The wash is quite violent in its action, and, although not poisonous, it should not be allowed to get on the skin or in the eyes any more than can be helped. The men engaged in the work sometimes wear veils or goggles to protect the face and eyes, while gloves are worn on the hands. If it is not desirable to wear gloves the hands may be protected by keeping them greased with vaseline, lard, or other similar material. Of course only old or cheap clothing should be worn.

It is well to have blankets or cloths over the horses if they are much exposed to the material used while applying it to the trees.

Cost of the Wash.—The cost of the wash, not counting the kettles, labor or pump used in applying it, is not more than two cents per gallon. This makes it a very cheap remedy for the San José Scale, and its great effectiveness more than makes amends for the extra trouble in making and the cautions needed in applying it.

Time to Apply the Wash.—The Lime-Sulphur-Salt wash is strictly a winter treatment and should never be used when the trees are in foliage in a general spraying. All general treatments with this wash should be made while the trees are entirely dormant. If it is desirable to use it in summer the application should only be made to the trunks and larger branches.

If only one treatment is to be given it should be given during December or January. If the trees are very badly infested with the San José Scale it will be better to make two treatments—the first as soon as the trees become thoroughly dormant, and the second as late as possible, *but before the buds begin to swell.*

Effect on Trees.—If applied as directed in this circular this wash does not injure the trees, even of such tender kinds as peach and plum. It is, on the other hand, very effectual against the scale. When the wash becomes dry on the trees they have the appearance of having been whitewashed.

Effect Lasts Longer than Other Washes.—One of the chief advantages of this wash over the soaps and oil emulsions is that it adheres for a considerable time to the trees and renders it difficult for young scale insects to gain a foothold upon them. Thus trees in Maryland which were sprayed late in winter were apparently kept almost entirely free from re-infestation during the following summer. The same effect has been noted in the North Carolina orchards in which this wash has been used.

Trim Trees Before Treatment.—It is desirable to trim the trees quite severely before applying this wash, so that all the parts may be more thoroughly treated.

Where to Get the Materials.—Lime may be had of any dealer in lime, plaster, cement, etc. It should be of good quality. Flowers of sulphur can

be obtained of any drug store, or ordered through other stores. The salt may be ordinary stock salt, which is easily obtainable.

THE ESSENTIAL POINTS TO OBSERVE.—The essential points to be looked after in regard to this material are as follows: (1) Have approximately one pound of sulphur for each three gallons of the final mixture. (2) Boil the mixture until all the ingredients are thoroughly dissolved. (3) Keep the wash well stirred while it is being boiled. (4) Strain the wash to remove sediment before it is sprayed. (5) Apply before it gets cold.* (6) Apply with the utmost care and thoroughness. (7) Use it only while the trees are dormant.

NOTE.—As this circular is being issued in January it is likely that a number of our growers have already sprayed their orchards with kerosene emulsions or soap solutions. If this is the case we would advise that they be not treated with this wash this winter, except in the case of badly infested trees, which should be given a treatment with this wash in February or early March, before the buds swell.

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*There is some evidence that the wash is just as effective when used cold, but until further tests are made it is best to apply it at least while still warm.

Entomological Circular No. 6.

SPRAYING APPLES AND PEARS.

By Franklin Sherman, Jr., Entomologist.

Introduction.—Four years of active work in North Carolina in inspecting orchards and nurseries, conducting various investigations regarding insect pests, and much correspondence with farmers themselves, has convinced us that the thorough, careful and persistent spraying of the apple and pear trees with the Bordeaux Mixture and Paris Green will do more than any other one operation to restore our now unprofitable orchards to a condition of productiveness.

For years it has been almost unknown to have a good crop of apples in the eastern part of North Carolina, and in recent years these failures are becoming more and more general in the middle and western sections. Our investigations have proved that these failures have been largely due to injurious insect pests and certain fungous enemies of the trees and fruit, which can be kept in check cheaply and effectively by spraying.

The spraying of trees, even when properly done, does not guarantee a crop. If no fruit is set, there can be no apples, no matter how thoroughly the trees are sprayed, and if the trees do not bloom there can be no crop. But the greatest trouble with our orchards is that the apples drop off before reaching maturity, and this is what we believe can be almost entirely prevented by proper spraying.

Eastern and middle North Carolina cannot compete with the western section in the growing of winter apples, but these sections can and should grow an abundance of summer, fall and early winter apples for use on the farms and to supply the local markets. In Raleigh and Wilmington markets the sprayed fruit from northern States bring the highest prices. The reason for this is that the northern fruit is better cared for on the tree, more free from insects and fungous diseases, is larger, more handsome, better quality, keeps longer and is consequently more desirable.

When the farmers and fruit growers of North Carolina take up spraying as a regular practice in their orchards and give the trees reasonable attention in regard to cultivation, fertilization and pruning, then they will have good fruits, *and not until then.* We make this statement confidently and emphatically, and are assured that the experience of the future, like that of the past, will abundantly support us.

The subject Spraying Apparatus has already been discussed in Circular No. 4, which will be sent on application.

What Injurious Apple Insects will Spraying Prevent?—*First*, and most important of all, there is the Codling Moth, which causes wormy apples. *Second*, the Plum Curculio, which scars the fruit, although it is not as destructive to this fruit as to the peach and plum. *Third*, the Tent-caterpillars, which appear in the spring as soon as the leaves unfold, and build white nests of web in the branches. *Fourth*, the Fall Web-worms, which appear about the first of July and which also make nests in the trees, and which are com-

monly regarded as the "second crop" of Tent-caterpillars, but is in reality a distinct species. *Fifth*, Canker-worms, which crawl with a looping motion, and which we have been told are sometimes exceedingly destructive in orchards in this State. *Sixth*, the Red-humped Apple-worms, which sometimes appear in numbers on individual trees in young orchards and nurseries and eat off the leaves. *Seventh*, the Tussock-moth Caterpillars, which are frequently destructive, not only to apples, but to shade trees as well, by devouring the foliage. *Eighth*, various other species of caterpillars, beetles, etc., which are more or less destructive in all orchards every year.

What Fungous and Bacterial Diseases will it Prevent?—The principal ones are: *First*, Apple Scab, which has been destructive in this State since 1867 and for which nothing has ever been done. *Second*, the Apple Rust, which lives upon the apple as a disease of the leaf, making yellowish spots and causing the leaf to drop early, and which also lives on the red cedar, causing what are commonly known as "cedar apples." *Third*, the Bitter Rot, which is more or less destructive in various parts of the State, and of which we have had special complaint from Durham and Granville counties. *Fourth*, various other rots and cankers that affect the trees and fruit to a greater or less degree.

An Important Point to Remember.—In this circular we are advocating the regular spraying of bearing apple and pear trees three times every year with Bordeaux Mixture and Paris Green, regardless of whether a crop of fruit is expected or not, and we have just indicated the principal pests against which it will be useful. But it should be remembered that there are certain other troubles which this treatment will not remedy, and which, if they are destructive, will require other treatment. Some of these are mentioned in the following paragraph.

What Pests will it Not Prevent?—The Bordeaux Mixture and Paris Green consists of water, lime, blue-stone and Paris Green. The water simply acts as a carrier to deposit the other substances on the trees. These substances are not dissolved and taken into the tree, hence they cannot reach any insect or disease germ or spore which is already inside the tissue of the plant. The blue-stone kills such germs and spores as may fall upon the surface where it is deposited. It therefore prevents the diseases from securing a foothold. The Paris Green remains upon the leaves and in the blossom end of the fruits, where it kills the caterpillars when they begin to feed. But an insect which takes its food by inserting its beak into the plant and sucking out the sap from within will not be affected by these applications, hence they are not of the slightest use against plant-lice or scale-insects, which must be combated by using other spraying mixtures. Neither will this application cure trees that are affected with Fire-blight, which is so destructive to pear trees and to the young tips of apple.

When to Spray.—Apples and pears should be sprayed three times every spring. These applications begin before the buds open in spring, and the last is given after the fruits are well set. We spray then before the pests appear, and this is essential to success, for it is utterly useless to spray for Codling Moth (for example) after the larva is inside the apple. The three exact times for spraying are as follows:

1st. Just before buds burst in spring.

2d. Just after blooms fall.

3d. About fifteen days after second spraying.

These applications should be made just as nearly at the times indicated as possible. It is especially important that the second application be made immediately after the blossoms fall. If the blooming is irregular and extends over a long period of time, it is best to spray as soon as the latest blooms are open, for by that time the earliest blooms will have fallen, and much delay prevents the application from being fully effective.

Repeat in Case of Rain.—If there is a rain before the application gets dry on the trees, it must be repeated, as the rain will wash it off. But if it once gets dry it will adhere for several weeks, so that a repetition of the application is necessary only when a rain comes soon after it is made. It is well, therefore, not to spray at a time when a rain seems probable, but make the application while it is fair.

Preparation of the Bordeaux Mixture and Paris Green.—The mixture may be best prepared by observing the following formula and directions:

Formula.

Blue-stone	5 lbs.
Stone Lime	5 lbs.
Paris Green	5 ounces.
Water (to make)	50 gallons.

Directions.—Place the blue-stone in a coarse sack and hang in a tub or keg of water so that it is just below the surface. (This may be done the evening before the spraying is to be done, so it will be dissolved by morning.) When the blue-stone is dissolved, add water to make twenty-five gallons.

Slake the lime in a tub or keg, and add water to make twenty-five gallons.

To combine these two solutions take equal parts of each and pour them together so that they will fall in one stream into a clean barrel or other receptacle, straining it through a sack at the same time to remove all sediment. This gives us the Bordeaux Mixture. It now remains to add the Paris Green. Mix this first with a little water to form a thin paste, and then wash it into the barrel with the mixture and stir thoroughly. The mixture is now ready to apply.

Use Soon After Making.—When the mixture is ready to use, it should be applied without undue delay, as the material will lose its strength upon standing. Either the blue-stone solution or the lime solution will keep for a month if kept alone, but when they have been poured together to form the perfect mixture, it should be applied that same day. Any that is left over at night should be thrown away.

Making the Application.—The spraying must be done with absolute thoroughness, yet with as little waste as possible. Lack of thoroughness is one of the most frequent causes of unsuccessful spraying. It will not answer to squirt a few drops of the liquid into a tree and then move on. Go round the tree so as to spray it from three or four sides, then if the tree is large, get under it and spray *upward* and *outward*, so as to reach the under surface of the leaves. Keep moving the nozzle about, so that only enough of the material is sprayed in a place to thoroughly dampen every inch of surface; it is not necessary to soak the tree until the liquid runs off in streams. Have the nozzle regulated to throw the very finest, most misty spray of which it is capable.

In the first spraying the special object is to get all the branches and twigs thoroughly treated to kill any fungous spores which may be present.* The

*It is not necessary to use Paris Green in the first spraying, but it must be used in the others.

special object of the second application is to get some of the mixture in the blossom end of all the young fruits. In the third spraying the aim is to reach all the fruits and leaves. Just the one small spot which the application does not reach seems to be the very place where a disease spore or an insect will do its destructive work.

Keep the Mixture Stirred.—Many spraying pumps are provided with automatic agitators, which keep the mixture stirred while the pump is being operated. If yours is not of this kind the mixture must be kept stirred with a stick.

Keep Mixture Free of Trash.—If trash or sediment is in the mixture while it is being sprayed it is liable to clog the nozzles. Care must be taken, therefore, that the mixture is properly strained and kept guarded as much as possible against such trouble.

Cost of Spraying.—The Bordeaux Mixture and Paris Green costs less than two cents per gallon, and two gallons will spray an eight-year-old apple tree of full vigor. That is to say, that the cost of the materials for three applications will not be over twelve cents. The amount gained in average years will be many times the cost.

Does Not Always Pay.—But there are sometimes years when spraying does not pay. It sometimes happens that there will be no fruit, even if the trees are sprayed, and then again it sometimes happens that there is fruit even if the trees are *not* sprayed. But in the vast majority of the seasons the man who sprays thoroughly and regularly will have an abundance of good fruit, while his more neglectful neighbor has little or none. Sometimes the most destructive pests are conspicuous by their absence, but as no one can foretell such an occurrence, and since these pests usually inflict great losses, the only safe course to pursue is to adopt spraying as a regular practice and keep it up just as consistently as you do the cultivation of your other crops.

Would It Interfere with Other Work?—One reason why more persons do not spray is because they fear it will interfere too seriously with other work. This is a matter with which we cannot attempt to deal. Our part is to find the means by which these problems can be surely and profitably met, and we submit that this circular fully explains the course to follow. If you are so anxious to make one more bale of cotton, or another load of tobacco, or a few more barrels of corn, that you are not willing to see that the orchard is properly sprayed, then that is your own fault, and *you* (and not the orchard) are to blame for its failures.

Let Us Know the Results.—We will be anxious to hear from all those who spray the coming spring, so that we may know with what degree of success your efforts are rewarded. Let us hear from you *now* if you intend to spray. Write to the firms listed in Circular No. 4, if you have not a pump already, and select an apparatus suited to your needs.

Give Pear Same Treatment.—While the discussions in this circular are mostly with reference to apples, yet the pear should be given the same treatment, since it is subject to most of the same serious pests as the apple.

Final Hints.—1. Make up your mind that you will spray every year. 2. See about getting suitable apparatus at once, if you do not already own it. 3. Make the three applications at the proper times. 4. Be sure that the Bordeaux Mixture and Paris Green is properly prepared. 5. Spray *thoroughly*, but not wastefully (there is a difference, and an application may be either without being the other). 6. Keep the material stirred. 7. Let us know the result.

Entomological Circular No. 7.

THE PEACH-TREE BORER.

(*Sannina exitiosa*, Say).

By Franklin Sherman, Jr., Entomologist.

Introduction.—The Peach-tree Borer is an exceedingly destructive enemy of the peach and plum throughout North Carolina, thousands of trees being killed by its attacks every year. It is this pest which causes large quantities of the "gum" to appear at the base of the tree, and every tree which is thus affected should be looked after before the warm weather of spring begins. This circular describes the insect, its life and habits, and the remedies to be used in its control. It will therefore be of interest to all who have peach trees, whether many or few.

Life-history and Habits.—(See Fig. 1). The adult insect is a moth, as shown in the figure. The female is larger and darker, being of a steel-blue color, with a bright yellow band about the middle of the body. The male is smaller and of a grayish color. Unlike most moths, both sexes have the wings more or less transparent, and this gives them a close resemblance to certain wasps, and this is especially the case with the male, which sex has both wings transparent. This resemblance is rendered all the more striking from the fact that they fly during the hottest summer days.

The moths appear most numerously during August and September,* and after mating, the females deposit their eggs on the trunks of the trees at or near the surface of the ground. Within a week the eggs hatch into small white caterpillars, which at once bore in through the bark and begin to eat out the inner bark and sap-wood. Here they live until full-grown. The exact

Fig. 1.—THE PEACH-TREE BORER.
Adult male moth to left. Adult female moth to right.
(After Riley).

time required to attain full growth seems to depend somewhat upon the length of the seasons, but most of them seem to reach maturity the spring after they hatch. Thus the larvæ which hatched from the eggs laid last summer will become full-grown this spring, during May, June and July—a few, perhaps, as early as April. When full grown the larva leaves the tree and spins a cocoon under the surface of the earth, within an inch or two of the tree. During sum-

*Upon one occasion we captured a male moth of this species at Gastonia, Gaston County, on the first of May, but there are very few which emerge at that season. Specimens bred in this office during the summer of 1903 emerged most numerously between September 7th and 12th, which was probably a little later than in the open orchard.

mer one may easily find the cocoons by searching for them in the gum and earth around the base of the trees. They are a little over an inch in length and are usually covered with bits of dirt, chips, etc. Within the cocoon the larva changes to a *pupa*, in which stage it is inactive, and in two weeks the moth emerges, which mates, lays eggs, and the life-story repeats itself.

Effect on the Tree.—The burrowing of the larva through the bark and sap-wood causes a great quantity of sap to flow from the wounds. This thickens with evaporation into the "gum" which is seen at the base of infested trees.

If the larva burrows completely around the tree, eating out all the sap-wood and inner bark, the tree will die just as surely as if girdled with an axe. This frequently takes place, especially when there are several of the borers in one tree. Upon one occasion we took twelve borers from a single peach tree—no wonder it was about to die.

Even if the tree is not fatally injured, the loss of vitality is so severe that it may remain in a weakened condition until it has had time to grow over the injured parts. It will be readily seen, therefore, that unless the trees are in some way protected from this insect they are likely to be kept in a weakened condition, and weak trees are all the more susceptible to other insects and diseases than those which are kept healthy.

REMEDIES.

As the insect does all its injury under the bark, it is not easily reached by any outside application, and we are compelled to rely largely on mechanical methods to prevent the moth from laying the eggs, or we must destroy the borers while they are in the trees. The latter is the more feasible and satisfactory method.

Worming the Trees.—This is the surest and most satisfactory method of dealing with this pest. The trees are wormed by hand, the earth being removed at the base with a hoe to a depth of two or three inches, so that the larvæ can be easily reached. Then the gum is scraped away with a knife, and the injured bark cut off to get at the burrows. The larvæ must be found in the burrow and killed. They are quite stout-bodied, with distinct brownish-yellow heads.

Note.—There are certain very slender white worms which are often found in the gum oozing from the base of injured trees which are not the larvæ of the Peach-tree Borer. Do not make a mistake on this point. These very slender white worms live in the exuding sap and do no injury whatever to the trees. It is therefore a waste of time to kill them. The ones you want to get are the more stout, thick-bodied larvæ with distinct brown heads, which bore in the bark and sap-wood. A little experience and close observation will soon enable you to recognize them readily.

Thorough Work Needed.—As in all other work against insect pests, very thorough work is necessary in dealing with this pest. If it is to be entrusted to a hired laborer, you should start him at the work and show him specimens of the borers at work on the trees, so he will know just what to look for. Also find some of the other harmless worms, mentioned above, and point them out to him. By attending to these points more careful and intelligent work may be obtained. The person doing the work should have a stout knife, so as to get at the borers readily. It is also sometimes handy to have a short piece of stout wire, by means of which the larvæ are reached when they are so deep in their burrows as to be out of the reach of the knife.

When to Worm Trees.—Late winter is the most favorable time for worming peach and plum trees. March seems to be the best month for the greater part of North Carolina, but any time in the winter will do. Trees which have not been wormed by the time this circular is sent out should be looked after without delay.

Mounding Trees.—The mounding of the trees is an important point which is not fully appreciated even by our large growers who already fully recognize the necessity of worming. After the trees have been wormed in late winter, earth should be banked up against the base to a height of four or six inches above the normal level of the ground. This compels the moths to lay their eggs high on the trunk, where the larvæ may be easily reached when the time comes for worming. About Thanksgiving time the mound is removed, as all eggs have then been deposited, and by removing the mound the larvæ are left exposed to the rigors of the weather, which will kill some of them. Then, when the trees are wormed again in late winter, the mounds are replaced once more, and so on. Thus the trees are kept mounded from March to late November, and not mounded from December to March, and are wormed during February or March.

May Worm Oftener.—Some of our best growers prefer to worm their trees twice each year, so as to get at the borers while they are young, before they have had time to do much damage. This is, of course, an advantage, but if trees are wormed once *thoroughly* each winter and *kept mounded during the summer*, one worming will usually be sufficient.

Protectors.—There are a number of devices upon the market which are designed to protect the tree by preventing the moths from laying the eggs. One such device was invented and is sold by Mr. Robert J. Miller, Lenoir, N. C., and consists simply of a section of terra-cotta piping of suitable shape, which is slipped over the tree while young. A modification of this is also offered, made in two pieces, so that it can be slipped about the trunk of larger trees and fastened together. Another device is a very sticky glue on stout paper, which is wrapped about the base of the trees so as to entrap the female moth. Some growers in Northern States smear the base of the trees with tar, but we advise our growers to be cautious in doing this, as it might hurt the trees in our milder climate.

While there may be merit in some of these protecting devices, we still advise our growers to place their principal dependence upon a thorough yearly system of worming by hand, and mounding.

Entomological Circular No. 8.

THE HARLEQUIN CABBAGE BUG.

(*Murgantia histronica*, Hahn).

By Franklin Sherman, Jr., Entomologist.

Introduction.—The "Harlequin Cabbage Bug" is known to most farmers and gardeners in North Carolina, though it is known under a variety of names, such as "Lincolnite," "A-Bug," "Terrapin Bug," "Fire Bug," "Cabbage Bug," "Collard Bug," etc. To most persons it is so familiar that the mere name is sufficient to call the insect to mind, but any who are not certain regarding the identity of the insect will have no difficulty in recognizing it from the illustration.

The insect is a veritable nuisance in all of the Southern States—so much so that some persons have given up the growing of collards or cabbage on account of its ravages. We wish to say that the measures here recommended are *not* entirely satisfactory, but they are the best known at present, and any one putting them into intelligent use will surely be greatly benefited thereby. A little work done *early* in the season, when they first appear, will take the place of much more labor later, and will save many plants.

Historical.—The term "Lincolnite," which is sometimes applied to this insect, is derived from the fact that it made its appearance in some localities during or about the time of President Lincoln's administration. The term "Sherman Bug," which is also sometimes applied to it, was adopted because it appeared about the time that General Sherman's army was operating most actively in the Southern States. On account of making its appearance at that time, many persons believe that it was originally a Northern insect and was introduced here as a result of sending these troops, with accompanying supplies, into this region. But this is a mistake, as the insect is really of Southern origin, and it merely happened to spread into North Carolina at about that time. The insect first attracted attention by its injuries in Texas and other States in the far South, and is believed to be of Mexican origin. At the present time it is recognized as a serious pest in the southern part of the Pacific coast region, and in the eastern States it is destructive as far north as Long Island. In the Mississippi Valley it is destructive as far north as the southern parts of Illinois and Indiana.

Life-history.—(Fig. 1). The adult bugs appear in early spring and begin to lay their eggs on the young cabbage or other plants of the same family. The eggs are shown at two places (*a*) in the figure—in one case enlarged and in the other natural size. They are usually laid in two rows, each containing six eggs, but one female may lay several such clusters of eggs. They are usually deposited on the under side of the leaf, are pearl-gray in color, with black markings, and barrel-like in shape. Within a few days the eggs hatch into small greenish bugs with black markings, which somewhat resemble the adult bugs, except that they are not so large and do not possess wings. These

young bugs are called *nymphs.** The nymphs are active and run about freely from place to place. They grow by shedding the skin from time to time to allow for further growth, each new skin being a little larger than the old skin which is cast off. There are four or five moults of the skin. These younger stages in the life of the insect are illustrated at *b* (natural size) and *c* (enlarged) in the figure. In the later stages of the growth of the nymph the wing-pads are easily seen on the shoulders. Finally the last nymph skin is shed and the bug comes forth with fully developed wings. The whole growth

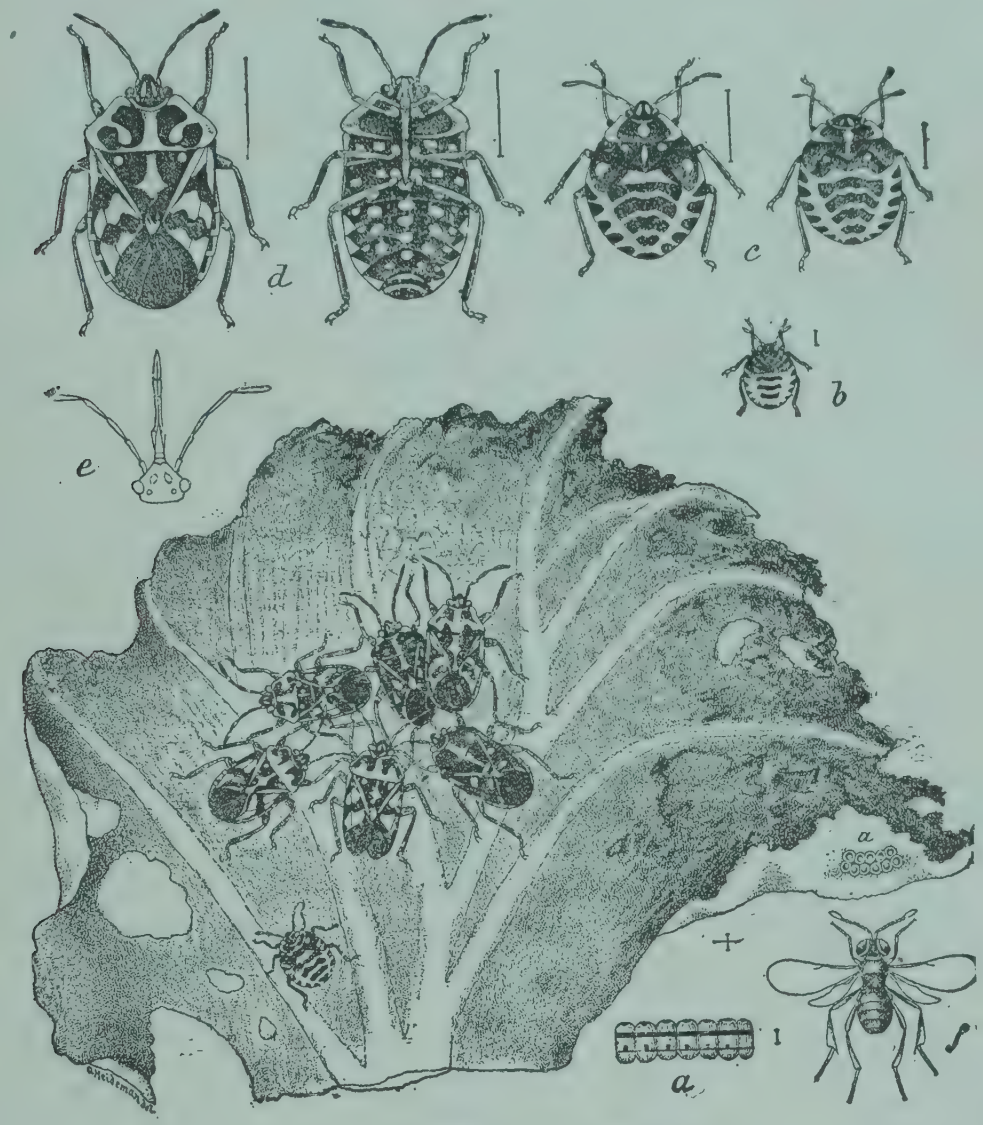

FIG. 1.—HARLEQUIN CABBAGE BUG.

a, Eggs, enlarged; *b*, young, enlarged; *c*, young, more enlarged; *d*, adults, seen from above and below, enlarged; *e*, outline of head of adult, enlarged; *f*, parasite, enlarged. Other figures natural size.

(After W. G. Johnson).

from the egg to the adult bug is accomplished in from three to five weeks, so that there may be several generations during the season.

As it is a native of the far South, the insect has some difficulty in passing through cold winters, and so far as we know only the adult bugs pass through

*The reader will recall that the young of the Hessian Fly, Boll-worm, Round-headed Apple Borer, and Peach Borer, are all known as *larvæ*, and this is the term applied to the young of those insects in which the young is grub-like, or otherwise entirely different from the adult insect; but in the case of those in which the young insects bear considerable resemblance to the adults, as in the Grasshoppers, Chinch Bugs and Cabbage Bugs, the young are called "nymphs."

the winter in this State. They are occasionally to be found during that season under logs, boards, stones and other rubbish, especially about gardens or fields where cabbage or collards were grown the previous season, and they remain in a dormant condition until cold weather is over.

Habits.—The adult insects are not usually very active, but are nevertheless able to run around and get out of sight on the under side of a leaf quite quickly when danger approaches. They do not fly about much, except when the plants upon which they are feeding die and they are compelled to seek other food.

During early spring the bugs have a habit of congregating together, many on one plant, instead of being scattered about on many different plants. This gives excellent opportunity for work early in the season, before they get scattered over the field or garden. Seeding turnips seem to have a special attraction for them at that season, and we well remember finding a large number of them upon a plant of this kind in a garden in Durham in the middle of April, before they had begun to be destructive to the newly planted garden. It is easy to destroy them very effectively at that time.

The first of the adult bugs for the present season were taken on a seeding turnip in a garden in Raleigh on April 2d (1904). By the time this circular is sent out, therefore, it will be high time to be doing the early work against them. You must begin *early* to have the best success.

Early in the mornings, while the bugs are chilled from the cool of night, they are much more sluggish than they are later in the day, and this also has an important bearing upon the control of the pest, as we shall see in the consideration of remedies.

How the Insect Feeds.—The Cabbage Bug does not eat the tissue of the leaves in the manner that the Potato Beetle does, and it is well for every farmer and gardener to understand thoroughly the difference. If the reader will look at the enlarged figures at the top of the illustration he will notice that there is presented an under-side view of one of the adult bugs. Notice the long, slender beak which projects from the head between the legs to the middle of the body. This beak is composed of several joints and contains several fine, bristle-like organs. The insect presses the beak against the leaf and then thrusts these little bristle-like lancelets into the tissues, causing a flow of sap, which is sucked up through the beak into the body of the bug. It is to be seen, then, that the insect gets its food entirely from *within* the plant, and that the food is *entirely liquid, consisting only of the sap.* Now with this fact firmly in mind, you can easily see that the application of a poison like Paris Green (which can only lie on the surface of a leaf) could not be of the slightest benefit, for the bug can no more eat the poison than you can eat dry bread by sucking it through a straw.

Natural Enemies.—Many kinds of injurious insects are preyed upon by birds, moles, toads, or even by other insects, but the Harlequin Bug has very few such enemies, and this is probably because of a peculiar odor and taste, for they belong to the "stink-bug" family of insects (Order *Hemiptera*, Family *Pentatomidæ*), many of which possess extremely strong and nauseating odors.

But while the insects themselves are thus comparatively free from attack, the eggs are not. In the lower right-hand corner of the figure, at *f*, is shown a small wasp-like insect, the natural size of which is indicated by the small x mark a little to the left. This little insect lays its own egg inside the egg of the Harlequin Bug, where it hatches into a tiny *larva*, which thrives within

the egg of the Harlequin Bug, reaching maturity and changing to a *pupa*, then to an *adult* again, all in the same egg where it was hatched. This, of course, kills the egg of the Harlequin Bug, and the little wasp-like insect is called a *parasite*, because it grows and reaches maturity entirely at the expense of another insect. This parasite is therefore very beneficial and is worthy of every encouragement possible.

As an experiment, we put some eggs in a little cage to hatch the young bugs, but instead there hatched out several little parasites similar to the one here shown. Not one young Harlequin Bug was hatched from all the twenty-nine eggs, while on the other hand nine parasites were hatched, but did not all emerge, because the eggs had become dry in the office where they were kept and had shrunken so that some of them could not get out. We see, therefore, that in this case the parasite was evidently doing a great deal to keep the insect in check. As a rule, however, this parasite does not seem to be very abundant in this State and cannot by any means be relied upon to keep the Harlequin Bug in check.

We have gone into some detail in describing the habits and life-history of this parasite, because it explains a very interesting and important point in economic entomology. There are thousands of different kinds of parasites, preying upon many different kinds of injurious insects, and they do a very great service, although it is not usually noticed or appreciated by the farmer, since they are so small as not to attract attention. It may be that we will discuss the matter of parasitism among insects more fully later, after the readers of these circulars have become more interested in insects and more anxious to learn all the interesting and important matters bearing on their control.

REMEDIES.

We have already seen that the insect *sucks* the *sap* from the plant, and therefore cannot be combated by the use of any poison like Paris Green. Experiments have failed to show any form of kerosene emulsion or other irritating material which is strong enough to kill the insects without at the same time injuring the plant. The methods which can successfully be used against the pest come under four heads: 1, *Trap crops;* 2, *Hand-picking;* 3, *Late planting;* 4, *Clean culture.* Any one, or two, or all four of these methods combined, if intelligently practiced, will yield good results. Try them and see, and then write to us at the end of the season and let us know whether you were successful.

Trap Crops.—The proper use of trap crops constitutes the best method for the grower who wishes to raise early cabbage and collards. A few rows of early mustard may be sown between where the rows of cabbage or collards are to be set. This will get an early start and will be large enough to attract the bugs before the cabbage is set, and as the bugs will take to the mustard by preference, they will congregate in great numbers. When ready to set out the cabbages, cover the mustard and kale with straw, and burn, bugs and all. If this is not convenient, spray thoroughly with pure kerosene, which will kill both the plants and insects, or knock them off into pans with kerosene. By thus killing off the early bugs before they have an opportunity to lay eggs on the cabbage, you may raise your crop in comparative safety, for while there will no doubt be a good number of bugs to appear, they will not be so abundant but that they can easily be kept in control by hand-picking.

In the spring the bugs may usually be found first upon seeding turnips which grow up about the garden, and at this season they have the habit of congregating together, many on the same plant, instead of scattering about. This makes it very easy to gather and destroy them. But it must be remembered that this work must be done *early in the season, before they get on the cabbage.*

Hand-picking.—This method consists simply in picking the insects off the plants by hand, or knocking them off into pans containing tar or kerosene. It is about the only method now employed in this State, but as it is generally practiced it is *far more troublesome* and *far less effective* than it will be if the following suggestions are observed:

1. The work of gathering and destroying the insects should begin *early in the season*, before they become numerous, so that the work shall not be so tedious, and also so as to kill off the early broods. 2. It should also be done *early in the day*, as it is then cooler and more comfortable to do the work, and also the bugs are then stiff from the chill of the night and are more easily caught. 3. All through the early part of the season search should be made for the eggs on the under side of the leaves as well as the bugs, and all eggs found should be crushed. 4. The work of controlling the bugs by hand-picking will be much easier if used in conjunction with the other methods here recommended.

Late Planting.—Mr. C. S. Brimley, of Raleigh, who has long raised his own family vegetables, informs me that cabbage and collards which are planted after about the first of August are practically free from the attacks of the bugs. We suppose that this is because by that time all the insects are concentrated in other gardens and fields, and very few of the bugs find their way into his garden. This is a good suggestion to those who do not especially desire to secure their cabbage early in the season.

Clean Culture.—We have seen that the adult bugs pass the winter in such sheltered situations as they can find, under rubbish, logs, boards, etc. It is well, therefore, to clean up all such places, so as to leave as few suitable places for them as possible. By thus keeping your own place clean and devoid of hibernating places, you will suffer much less from these insects than your less enterprising neighbors.

Entomological Circular No. 9.

THE POTATO-BEETLE.

(*Doryphora 10-lineata*, Say).

By Franklin Sherman, Jr., Entomologist.

Introductory.—The Potato-beetle is a well-known pest to most farmers and gardeners in North Carolina, although there are some localities in which it may not yet be well established. Most potato-growers use Paris Green as a remedy with good results, yet there are some who still adhere to the impossible theory that the use of Paris Green on the foliage will hurt the potato—a thing which could not possibly occur. Even among those who use the green with success against the beetles there is much irregularity in the quantity used, and not infrequently the leaves are burnt by an overdose of the poison, though this has no poisonous effect whatever upon the tuber.

For those who at present rely upon hand-picking, or who use no measures whatever, this circular presents simple and practicable remedies, while for those who are already familiar with the use of Paris Green as a remedy it presents the formula and directions for making and applying the Bordeaux Mixture and Paris Green, which, when used together, will give better results than when Paris Green is used alone, and will, we believe, be worth more than its cost in aiding the general health and vigor of the plant, even if the beetles were not to be reckoned with.

Historical.—In Circular No. 8 we showed that the Harlequin Cabbage Bug was a native of the far South, although the common opinion is that it came into our midst from the Northern States. A similar mistaken idea exists regarding the Potato-beetle, for it is very generally believed to have been brought into the Southern States in shipments of northern-grown seed potatoes; but this is an error, for the insect is of western origin and was first known in the Rocky Mountain region of Colorado, for which reason it is often called the "Colorado Potato-beetle," but since it has now become so widely distributed, we prefer to call it simply the "Potato-beetle."

In its native haunts in the Rocky Mountain region the Potato-beetle fed upon a wild species of plant closely related to our cultivated potato. When white settlers invaded that country and destroyed the native plants the beetle was compelled to seek other food, and soon acquired a taste for the cultivated potato, and as there was an unlimited supply it began to increase with great rapidity and spread from potato-patch to potato-patch. Its march across the continent began about 1860. At first it moved eastward at the rate of about fifty miles a year, but later it moved more rapidly, aided to some extent, no doubt, by being carried in vehicles of travel.

Its Record in North Carolina.—As nearly as we are able to ascertain, the insect appeared in North Carolina about 1877, and from the writer's observations he is led to believe that it probably first appeared in this State in the vicinity of Charlotte or Gastonia. In any event, it is certain that at the present time Mecklenburg and Gaston counties are among the greatest sufferers. On the other hand, we are informed by Mr. J. B. Pinner, of East Lake, Dare

County, that in his vicinity it appeared in destructive numbers in 1900 for the first time. It may be, therefore, that there are still some few localities where it has not become firmly established, but it is certainly present and very destructive throughout all the principal potato-growing sections of the State.

LIFE-HISTORY.—Let us consider the life-history of the insect carefully, for by so doing we may get at some facts not generally understood, and may get rid of some erroneous ideas which are commonly believed by farmers in this State. The reader should closely study the figure while reading this paragraph, so that he will be able to recognize the insect in all its stages.

FIG. 1.—THE POTATO-BEETLE.

a, Eggs on leaf; *b*, small and grown larvæ; *c*, pupa; *d*, adult beetle; *e*, enlarged wing-case of adult; *f*, enlarged leg of adult.

(After C. V. Riley, Missouri Reports).

The adult striped beetle, shown at *d* in the figure, appears in the spring about the time that the potatoes come up, having passed the winter underground. The beetles at once begin to feed on the foliage, mate, and lay their eggs. The eggs (shown at *a*) are yellow and laid in clusters of from thirty to fifty or more, usually on the under side of the leaves. In a few days the eggs hatch into small, soft-bodied reddish *larvæ*,* with black head and legs, such as shown at *b* in the figure. The larvæ are ravenous eaters, feeding on the foliage of the potato, and grow rapidly, becoming gradually lighter in color, until, when fully grown, they are of a dull reddish-pink color. The larvæ grow by shedding the skin from time to time, each new skin being slightly larger than the one which preceded it. There are four or five moults of the skin with the larva of the Potato-beetle. It takes the larva from three to five weeks to reach full growth after hatching from the egg, and then it leaves the plant and enters the ground, where it changes to the *pupa*, shown at *c*, in which stage it is inactive and takes no food, but is simply passing from the larval stage to that of the adult beetle. The pupa stage lasts about ten days, when the insect emerges as an adult beetle, and thus the life-cycle is completed. Now remember that the grub-like form shown at *b* in the figure is simply the larva of the adult beetle shown at *d*—the one is simply a different

*Note that in this case the young are called *larvæ*, while the young of the Harlequin Cabbage Bug are called *nymphs*. For explanation of this, see note at bottom of page 2 of Circular No. 8.

stage of the other, and if all of one stage were absolutely destroyed there could be none of the other, and all that we can do to check one acts also as a check to the other. It is all one insect, simply in different stages of its existence. A single adult female in the course of her existence may lay five or six hundred eggs, and as the larvæ come to maturity quickly, as already stated, there may be four, five or six generations produced in a season, the exact number being obviously difficult to determine, and it no doubt varies according to the length of the seasons, abundance of the food-plant, etc.

It should be carefully noted that there is no time in the life of the insect when it lives upon or within the tuber of the potato. It is not, therefore, planted in the seed potatoes, and the reason of its "coming up right along with the potatoes," as it sometimes does, is plain when we consider how the insect passes the winter.

Hibernation.—In the fall, after the vines are dead or removed from the fields and the frosts begin, the adult beetles go underground, or under rubbish, to pass the winter. Dr. E. Porter, of Rocky Point, Pender County, informs me that upon one occasion he found a number of the beetles huddled together under a loose shingle on a shed which he was repairing—so they are not particular where they spend the winter, but they must be to some degree protected from the weather and from birds. The majority, no doubt, spend the winter under the ground, and, naturally, the ground where there has been a potato-patch during the summer will be likely to contain many beetles during winter, especially if the vines remained green until the frost forced the insects to seek winter quarters. Of course, if the potatoes were of an early variety, so that the vines were all dug, dead and cleared away before the approach of autumn, the beetles would probably go elsewhere.

Now, in the spring the farmer plants his potatoes, and with the first few warm days they sprout and come up. The same warm weather arouses the Potato-beetle from his winter nap and he comes forth ready for business, and works destruction to the potatoes. So you see *the beetles are not planted with the seed potatoes, as some think, but they hibernate under the surface of the earth and come out in the spring at the time that the potatoes come up.* If a piece of new land be planted in potatoes very few of the beetles will appear when the potatoes come up, and they will only become troublesome after enough of the insects have flown in to do damage.

Food Habits.—But the reader must not think that the presence of the insect depends entirely upon Irish potatoes being grown, for it also feeds upon a number of other plants. It is frequently found on the common prickly Horse-nettle, and also upon the Deadly Night-shade, both of which plants are related to the cultivated Irish potato. Mr. C. S. Brimley of Raleigh informs me that in his garden they are as destructive to egg-plants as they are to potatoes, and the writer has long known that they feed to some extent upon that plant. Of course they may feed to some extent upon other plants and may be found (incidental to their flight from place to place) on a number of others.

Natural Enemies.—English sparrows have been observed to eat these insects, as has also the beautiful rose-breasted grossbeak, but in general they are quite free from the attacks of birds. One or two species of parasites have been found to infest the larvæ, and a good many of the eggs are devoured by certain Lady-beetles and Ground-beetles, but all these do not seem to lessen their numbers materially, or at least in average years they are not sufficiently numerous to furnish an adequate protection.

REMEDIES.

General Remarks.—The remedies to be used against this insect are so very cheap, sure, simple and safe that there is really no reason why our people should suffer any serious loss from its ravages. The proper use of Paris Green is a sure remedy, and a cheaper one than most of the patent or proprietary substances upon the market. It may be used in a dry application or in water and applied as a spray, but the very best way in which to use it is in combination with the Bordeaux Mixture, for then the plants will not only be protected from the Potato-beetles, but also from various blights which affect the vines, and scabs and rots which affect the tuber. Indeed, as a person remarked to the writer, "A person who hasn't energy and intelligence enough to kill the Potato-beetle ought not to have any potatoes."

There are a good many patent remedies upon the market, some of which are of merit, but almost without exception the poisoning principle employed is arsenic, the same as is in Paris Green, and these patent remedies are for the most part more expensive than the Paris Green when it is used in the proper proportions as here recommended. Among these patent remedies that known as "Bug Death" seems to be in most general favor.

Note that in the recommendations which follow we give the *strongest recommendation* to the Bordeaux Mixture and Paris Green; we give the *second place* to the Paris Green, lime and water, and *third place* to Paris Green and air-slaked lime applied dry. Where only a very few potatoes are grown the insects may be picked off by hand.

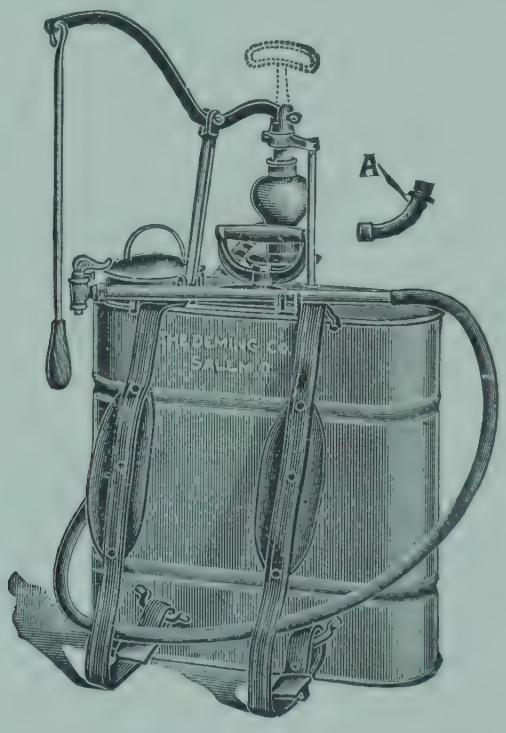

Fig. 2—A KNAPSACK SPRAYER.

A good type of Spray Pump for use in potato fields. One man can spray from two to three acres per day.

(From The Deming Company).

In applying the Bordeaux Mixture and Paris Green, or the Paris Green, lime and water, a spray-pump is needed to do the work to best advantage. The whole subject of spraying apparatus is so fully discussed in Circular No. 4 that we need not enter into detail here, further than to mention that for spraying

anywhere up to six or eight acres Knapsack pumps or good compressed-air sprayers are best, while for use in very large fields barrel or wagon-tank apparatus may be used, rigged with piping and nozzles to spray several rows at a time. Write to the firms listed in Circular No. 4, and ask for their catalogues of spraying apparatus. If you have not that circular, write to me for it.

The fears which some entertain that the use of Paris Green on the foliage will poison the tuber of the potato is utterly without foundation and need not be seriously considered for a moment. It is to be noted, however, that when used at too great strength the green has a burning effect upon the leaves. The proportions here recommended are much weaker than those generally used, hence more economical, yet plenty strong enough to serve every purpose if the applications be thorough.

1. Paris Green and Air-slaked Lime.—Mix good quality of Paris Green with thoroughly air-slaked lime at rate of one ounce of the green to four pounds lime. A cheap grade of flour may be used instead of lime, in which case use six pounds to each ounce of the green. Mix the materials thoroughly with the hands, and then, to make the mixing more certain and thorough, it is well to sift through a fine sieve, which will at the same time remove lumps. When ready to apply, the color of the whole should be uniform, with no spots or streaks which show more greenish color than others. Apply by sprinkling by hand, or by shaking from sacks made of loose cloth (cheese-cloth will do), or with a powder-gun or bellows. The application can best be made in early morning while the plants are wet with dew, for at that time it will stick better. Make the first application as soon as the beetles appear, and repeat as often as is seen to be necessary.

Remember that we give this *third choice* among the *three* methods here recommended—in other words, we regard it as the least satisfactory, but it will be found practicable for the man who will not provide himself with spraying apparatus.

2. Paris Green, Lime and Water.—Slake two ounces of lime, and to the milk thus formed add water to make ten gallons. Mix one ounce of Paris Green with a little water in a cup or saucer to form a thin paste, and then wash it into the water with the lime. This gives one ounce Paris Green, two ounces of lime, to ten gallons water. Strain to remove sediment, and apply with a spray-pump. If pump is not to be had, the application may be made with a watering-pot or brush, but spraying it on with a regular spray-pump is preferable. Keep thoroughly stirred, so that the ingredients shall not settle.

Remember that we give this *second choice* among the *three* methods here recommended, the *first choice* being in the next method discussed.

3. Bordeaux Mixture and Paris Green.—We give this first choice among the methods for controlling the Potato-beetle, and also for aiding the general health and vigor of the potato plant. Prepare according to the following directions. Make three or four applications:

Dissolve five pounds blue-stone in four or five gallons of water by hanging in a sack in a keg in which the water is placed, the sack containing the blue-stone being just below the surface. When entirely dissolved add water to make twenty-five gallons; now slake five pounds of lime and add water to make twenty-five gallons. These two solutions, the one containing the blue-stone and the other the Paris Green, are to be kept separate, and the blue-stone solution must be kept in a wooden receptacle. Whenever it is desired to make an application take out equal quantities of the two solutions and pour together,

stirring thoroughly. This gives the perfect Bordeaux Mixture, to which Paris Green is added at the rate of one ounce to every ten gallons. Mix the green first with a little water in a cup or saucer and then pour into the Bordeaux. Strain to remove sediment and apply with a spray-pump or with watering-pot or brush if pump is not to be had. (But you *should* have a pump; there is no doubt about that. See Circular No. 4 on that subject).

Remember, that if the blue-stone solution and lime solution are kept separate they will retain their strength through the season, but when they have been poured together to make the perfect Bordeaux Mixture it should be used within one or two days at most. Remember, also, that the Bordeaux alone is not fatal to the beetles, but the Paris Green must be added.

Why Not Experiment?—If you have any doubt about the benefits to be derived from the methods here recommended, we would suggest that you try the treatment on part of your potatoes and see how the result compares with those not treated. We repeat that it is our firm belief that the spraying with Bordeaux Mixture will more than pay for itself in the general health and vigor imparted to the plant, and would be a profitable treatment even if there were no beetles to fight, and with the Paris Green added it becomes an excellent protection against biting insects as well as fungous diseases.

A Request.—We hope that all those who try the measures recommended in this circular will notify the writer of the results when the time comes for the harvest. Notice these points: 1. Does the application kill the beetles satisfactorily? 2. Do you find spraying a better method than dusting? 3. When Bordeaux Mixture and Paris Green are used do you find that the potatoes are better in quality and yield than where Paris Green is used without the Bordeaux?

Entomological Circular No. 10.

PREPARATION AND USE OF KEROSENE EMULSION.

By Franklin Sherman, Jr., Entomologist.

Introduction.—Kerosene Emulsion, at various strengths, is one of the most useful remedies against insects, especially those which suck the sap from the plant and which therefore cannot be killed by the application of Paris Green. Prominent among these sucking insects against which the Kerosene Emulsion is used may be mentioned all the different species of Plant-lice or Aphids and the Scale insects. It is true that the lime-sulphur-salt wash discussed in Circular No. 5 is now the best remedy for the San José Scale, but at its full strength it can only be applied in winter while the tree is in dormant condition; hence we must still look to the Kerosene Emulsion if we wish to make spring, summer or early fall applications.

Now the proper use of the Kerosene Emulsion requires care and accuracy in its preparations and application, because the oil has a tendency to destroy foliage, and as different kinds of plants are not the same in their ability to withstand the oil, we use different strengths of the Emulsion, according to the insect to be combated and the plant which is infested.

Kerosene Emulsion can only be applied with safety with a spray pump. We have repeatedly urged farmers, truckers and fruit-growers to provide themselves with good spray pumps. If you have not yet done so, and wish now to look into the matter, write to me for "Circular No. 4, on Spraying Apparatus," which will be gladly sent you.

There are certain makes of spray pumps on the market which, mechanically, make an emulsion of oil and water. This is done by placing the oil in a separate and smaller tank attached to that holding the water, and the working of the pump forces the two together as they leave the nozzle. We wish to advise our readers not to get this kind of a pump, for the reason that they are more costly and are not *always* reliable. While the manufacturers of these pumps are for the most part strictly honest and have made every effort to bring this kind of pump to perfection, yet it seems at the present that their ingenuity has not succeeded in giving us an entirely reliable apparatus of this sort. Our advice, therefore, is to carefully *study* this Circular until you thoroughly understand every fact and figure given and then depend upon making and diluting your own emulsion.

PREPARATION OF THE EMULSION.

Stock Emulsion.—By a "stock emulsion" we mean an emulsion which shall be of a certain, definite, known strength, which can be kept for a long time and diluted for use to any weaker strength at any time desired. As usually prepared, and as is here recommended, the stock emulsion will be 66⅔ (sixty-six and two-thirds) per cent oil; in other words, for every 100 pints of this stock emulsion that would be prepared by the following formula, sixty-six and two-thirds pints would be oil and the remaining thirty-three and one-third pints would be water.

It is well for those who are frequently troubled with lice on cabbage or other truck crops or fruits to make up each spring a sufficient quantity of the stock emulsion to last through the season. Notice that the stock emulsion is not itself sprayed directly upon the plants, but is first diluted with water. Thus, if one were to calculate that he would need, during the season, not more than twelve gallons at strength of 15 per cent oil, he would only need to make *three gallons* of the stock emulsion, and, when the 10½ gallons of water necessary to reduce this to 15 per cent oil were added, he would have 13½ gallons of the 15 per cent strength. So in making up the stock emulsion one makes up only a portion of the actual quantity of liquid needed for the spraying, the remainder being simply water, which is added at the time the spraying is to be done.

Kerosene Emulsion may also be used on domestic animals as a remedy for fleas, lice, etc.

FORMULA AND DIRECTIONS FOR PREPARING EMULSION.

Formula.

Kerosene (coal oil)	2 gallons.
Water	1 gallon.
Soap	½ pound.

(Larger or smaller quantities may be prepared as desired, but the *proportions* here given must be observed).

Directions.—Shave the soap into thin pieces into the water. Place over fire and heat until the soap is dissolved. *Remove from the fire* and pour in the kerosene and churn the mixture together very thoroughly. This may be done by pouring the materials directly into the tank of the pump and, turning the nozzle into the tank, pump the emulsion rapidly back into itself until it is thoroughly stirred together, which will require only one or two minutes' pumping. The mixing may also be done by pouring the kerosene and soap-water into a can or pail and churning together with a stout stick with dasher, but this requires more effort (and is probably less satisfactory) than mixing by using the pump. In any case this mixing of the oil with the soap-water must be done immediately after the soap-water is taken off the fire, for it must be hot to mix properly. This formula gives three gallons of stock emulsion, which is 66 per cent oil.

DILUTING THE EMULSION.

General Remarks.—It will be noted that the formula just given results in a stock emulsion of three gallons, which is 66 per cent oil. It is very likely that you would prepare it in larger or smaller quantity than that, or even if you had it in that quantity, you might wish to dilute only part of it at a time. If this were the case you would follow the table given in the next section, which gives the formula for diluting one gallon of the stock solution to any desired strength.

On the other hand, if you have prepared the stock solution in exactly the quantity called for in the formula given, and wish to dilute the whole quantity at one time to a certain strength, you will follow the table given in the section *after* the next. In any case it is advisable to use hot or very warm water in diluting the emulsion and stir together thoroughly as it is being poured in by using the pump as already mentioned.

To Dilute Part of the Stock Emulsion.—Now, if you have prepared a greater or less quantity than is called for in the formula given, or if you wish to use only a part of the stock solution at a time, you may dilute it as follows: Having your stock emulsion, in whatever quantity, at strength of 66 per cent oil; for each *one gallon* of the stock emulsion you would add water as follows to get the different strengths:

(To each one gallon of stock emulsion at 66 per cent oil).

To get 10 per cent oil emulsion add 5⅔ gallons water.
To get 15 per cent oil emulsion add 3½ gallons water.
To get 20 per cent oil emulsion add 2⅓ gallons water.
To get 25 per cent oil emulsion add 1⅔ gallons water.
To get 30 per cent oil emulsion add 1⅓ gallons water.
To get 40 per cent oil emulsion add 2⅔ *quarts* water.
To get 50 per cent oil emulsion add 1⅓ *quarts* water.

To Dilute the Whole Quantity.—If you have prepared your stock solution exactly in accord with the formula given you will have 3 gallons of the 66 per cent oil strength. If you now wish to dilute this all at once to a certain strength you will follow this table:

(Having 3 gallons of stock solution at 66 per cent oil).

To get 10 per cent oil emulsion add 17 gallons water.
To get 15 per cent oil emulsion add 10½ gallons water.
To get 20 per cent oil emulsion add 7 gallons water.
To get 25 per cent oil emulsion add 5 gallons water.
To get 30 per cent oil emulsion add 4 gallons water.
To get 40 per cent oil emulsion add 2 gallons water.
To get 50 per cent oil emulsion add 1 gallon water.

APPLYING THE EMULSION.

Why Spray Pump is Necessary.—Of course the Kerosene Emulsion *could* be applied with a sprinkler or brush, but that would be *wasteful of the material and very dangerous to the plant, and not nearly so effective against the insects.* Therefore a regular spray pump is necessary to make the application economically, safely and effectively. Spray pumps throw the emulsion under considerable pressure through a very fine nozzle, so that it comes out as a fine, foggy mist, by means of which much spraying can be done with little of the emulsion, thus greatly lessening the cost and labor and increasing the benefits of the application. The fine spray penetrates readily into much smaller cracks and crevices than could be reached in any other way.

Apply in Fair Weather.—If the emulsion remains on the plants for any great length of time the bark is apt to absorb so much of the oil as to result injuriously to the plant; therefore it is better to make the applications in fair weather, so that it will evaporate rapidly. The very best conditions are *bright* and *cool* weather with a light breeze, but if used with the care advised below no injury will be likely to result, even if the weather is decidedly unfavorable.

Kills by Contact Only.—It must be borne in mind that the Kerosene Emulsion is not a poison which will kill the insects simply by being placed upon the leaves where they will eat it, as is the case with Paris Green. It kills insects by coming into actual contact with them, hence the application must be as

thorough as possible to reach the different individual insects. It is usually only used against sucking insects which could not in any way be affected by using Paris Green.

Care Necessary in Application.—We have already remarked that the oil has a tendency to injure the plants. Not only will too strong applications kill the leaves, but if allowed to run in at the roots may be fatal to the plants even if not applied to the leaves at all. Care is needed, therefore, to see that the emulsion is plenty strong enough to kill the insects, and at the same time not strong enough to hurt the plants. In future Circulars we shall frequently recommend the use of Kerosene Emulsion for various insects, but this caution will always be kept in mind. In making the application it must be so thorough that the spray shall touch all affected parts, so as to come into contact with the insects, but beyond this we must not go. Do not drench the plant until the emulsion runs down the stem or trunk and in at the roots. Simply spray until every part is thoroughly dampened with the mist, and no more. This result is usually most easily obtained by having the nozzle from one to three feet from the parts being sprayed.

Insects Combated with Kerosene Emulsion.—We could not possibly go into details here to explain the treatment for all the insects against which the Kerosene Emulsion may properly be used. As we have already indicated, they are, for the most part, Scale-insects and Plant-lice. We may, however, make brief mention of some of the more notable cases.

Cotton-louse.—Spray with 15 per cent emulsion as soon as they appear and before they get scattered throughout the field.

Rose-louse.—Spray with 15 per cent emulsion when they appear.

Cabbage-louse.—Same (before leaves get curled).

Green Apple-louse.—Same (before leaves get curled).

Woolly Aphis of Apple.—Same.

Black Aphis of Peach and Plum.—Same (before leaves get curled).

Pea-louse, or Aphis.—May use the emulsion at 10 or 15 per cent, or tobacco dust. We have not yet fully settled this point.

San José Scale.—Spray with 15 per cent emulsion after leaves come out or at any time until fruit is one-fourth grown, but not when in bloom or until the fruit is set after blooming. Same applications may be made in late summer after fruit is off. Lime-sulphur-salt in winter.

Oyster-shell Scale-louse.—Spray with 20 per cent when they begin breeding in spring (about May 1st in most years).

Lice, Ticks, Fleas, Flies, etc.—For use on cows, horses, dogs and sheep, use not stronger than 25 per cent. On hogs 50 per cent may be used. Wash the animals as often as needed.

Scurfy Scale-louse.—Same as just mentioned for Oyster-shell Scale-louse.

If You do not Understand.—If there are any points not made clear in this Circular the writer will be glad to explain by personal letter. We *expect* you to write us about these matters. In any case let me know at any time that you intend to use the emulsion and state the insect for which you will use it.

Entomological Circular No. 11.

THE SAN JOSE SCALE.

(*Aspidiotus perniciosus*, Comstock).

By Franklin Sherman, Jr., Entomologist.

Introduction.—The San José Scale (pronounced San Ho-zay) is widely distributed in North Carolina and does great harm to orchard trees which become infested, unless they be thoroughly and persistently treated. In order to combat it to the best advantage a thorough knowledge of its life-history, habits, means of spread, etc., is necessary. It is the object of this circular to give information on these points. We have not here gone into detail regarding remedies, for the lime-sulphur-salt wash, which is at present the best remedy known, has already been treated of in Circular No. 5, which may be had on application, and we expect later to give a more complete consideration of the

Fig. 1.—THE SAN JOSE SCALE.

a. Appearance of infested twig, natural size. *b*. Part of infested twig, as seen under a lens.

(After Howard and Marlatt, U. S. Department of Agriculture).

subject of remedies in a separate circular. If any one, after reading this circular and carefully examining his trees, becomes convinced that they are infested, he should cut some of the infested twigs and mail them to this office for examination.

Appearance of the Insect.— Trees that are badly infested with the San José Scale appear as if they had been dusted over with ashes. If the branches and twigs where the insects are numerous be scraped with a knife it will be seen that this unnatural covering is quite easily removed, coming off in little flaky patches. Examined under a hand magnifying-glass the thickly-infested twigs present an appearance as shown at *b* in Figure 1. Each of the little circular gray objects is a separate scale, each covering a tiny yellow insect underneath. On thickly infested branches they often become so crowded that the scales are piled over one another so that the real bark of the tree is not visible at all. Branches and twigs which are only slightly or moderately infested will not be thus completely covered over, and the bark may be of its ordinary color and appearance except here and there along the branches where the scattering scales are found. The largest full-grown scales are about the size of an average pin-head. They can, therefore, be detected by any person who has in the beginning an intelligent idea of the insect, has sharp eyes, and who happens to look in the right place.

Usually the farmer or fruit-grower does not know that there is any serious trouble until the trees begin to die. By that time they are covered by the scales and present the ashy appearance. Then, if the owner finds that his trouble is San José Scale, he is apt to think that it is only on those trees that present the unnatural appearance, when in reality it may already be on every tree in the orchard. Such a mistake often costs the lives of many trees, since the owner, instead of examining closely and treating every infested tree, as he should do, simply takes out those which are already in dying condition, and then, because he sees no more of similar appearance, he imagines he has *exterminated* it, when as a matter of fact other trees moderately or slightly infested still stand in the orchard and soon begin to die, having in the meantime spread the insect into still other trees, and so on, until the whole orchard may be ruined.

Where the scales are not numerous enough to crowd one another each individual grows to somewhat larger size than when they are crowded. Where the scales are scattering along the branches each scale is *usually* (but not always) in the center of a slightly reddened spot on the bark. If the natural color of the bark be reddish this spot will not show plainly, but if the bark be of a light green or yellow, the reddish spots are quite conspicuous. *In looking for scales on slightly infested trees it may usually be more readily found by looking for these reddish spots than by looking for the scale itself, but close watch must be kept for both scales and blotches.* If such a spot be found, however, it must then be examined to see if it is caused by a true scale-insect, for there are certain unimportant diseases which may have a similar effect. If the little gray, circular scale is found in the center of the spot, and if the scale is readily moved by scraping gently with a knife-blade or with the finger-nail, then you may be pretty sure that it is San José Scale, and should at once send specimens to the Entomologist and find out.

Turn one of the scales over gently with the point of a knife. If it is one of the large, full-grown scales the insect may as likely be dead as alive under it, for the scale often adheres long after the insect is dead. If the insect is alive

it will be seen as a little yellow object—slightly egg-shaped, but more pointed at one end, and slightly flattened. Indeed it has been well described as resembling a tiny bit of cheese or yellow butter. Press the body with the point of the knife or pin and it is easily crushed, yielding a tiny bit of yellowish, oily liquid. If, on the other hand, the insect is dead, the dried body will be likely found simply as a thin yellowish-brown particle under the scale.

If you simply rub the flat of the knife-blade along a thickly infested branch the insects will be crushed in such numbers that the oil from their bodies becomes quite conspicuous, though of course not enough to run down the limb.

Male and Female Scales are Different.—In Figure 1, note in the enlarged picture that in the extreme lower right-hand corner there is a scale which is oblong in shape rather than rounded. Two other similar scales are seen near the left border of the figure, about an inch from the top. These are *male* scales, and may be at once distinguished from the female scales, which are nearly circular. The very large circular scales are of the full-grown female insects, and these, at largest, are about the size of a pin-head, so you can see that by comparison the partly-grown scales are quite small. Females are usually much more abundant than the males.

Young Insects and Young Scales.—Now look at Figure 1 again. On the right-hand border, about an inch from the top, notice an insect which has legs. This is a young scale-insect which has a few hours liberty after birth before it begins to feed. At this stage it can crawl about. Several are to be seen in the figure, especially near the top. These young insects when in this active crawling stage are so extremely small as to be barely visible with the unaided eye, and are yellow in color. After the young insect has crawled about for an hour or so it becomes hungry and inserts its slender, delicate beak into the tender bark and begins to suck the sap. Then the scale begins to form over its body. At first it is oblong, of the same shape as the body of the young insect and whitish, as shown in the center of the figure, at the top. Then the scale becomes more rounded, and as it grows it becomes darker, until it is dark gray or almost black. Once the scale begins to form over the body the insect remains attached to the bark at that spot.

The Full-grown Insects.—The full-grown female insects always remain under their circular scales and there give birth to their *living young*, for this species does not lay eggs as is the case with most insects. The males, on the other hand, finally develop into tiny two-winged fly-like insects, but in consequence of their sex they cannot play much part in spreading the insects, as young can only be born where females are present, and these, as we have stated, remain attached to the twigs.

The Life-history of the Insect.—Many points in the life-history have already been mentioned. The females begin to give birth to living young in the spring. In this the San José Scale is an exception to the rule among insects, which in most cases lay eggs. At Raleigh, breeding begins from March to May, depending on season. After crawling for a short time the young insects insert their beaks and begin to feed. Then the skin is shed and the scale begins to form over the body and the insect is thus confined at that spot. When the skin is shed, the legs, eyes and antennæ (feelers) are shed off with it, and thereafter the female insect is always eyeless, legless and wingless; simply has the organs for taking and digesting food and for reproduction. It takes the females from thirty to forty days to reach maturity and the males

not quite so long. The male develops finally into a tiny, yellowish, two-winged flying insect. Strange to say, the mature male insect has no mouth for taking food, the position of that organ being occupied by an *extra* pair of eyes. This renders it more proficient in finding mates and thus aids in the multiplication of the species. In this State there are probably from five to eight generations in a season, and the number of progeny of a single fertile female in the course of a season, if there were no fatalities, would, by actual calculation, number among the *billions*. Remembering that many of the insects are destroyed by enemies as described later, we can still see that it is no wonder that a tree that becomes infested while young is almost sure to die unless thoroughly and persistently treated. The most active period of increase is during August and September.

HIBERNATION.—When really cold winter weather comes on the insects cease to breed. During the winter the adult insects nearly all die, so that it is mostly the partly grown insects that pass the winter. However, in warm winters we have known the insects to breed even in midwinter on warm days in the warmer sections of the State.

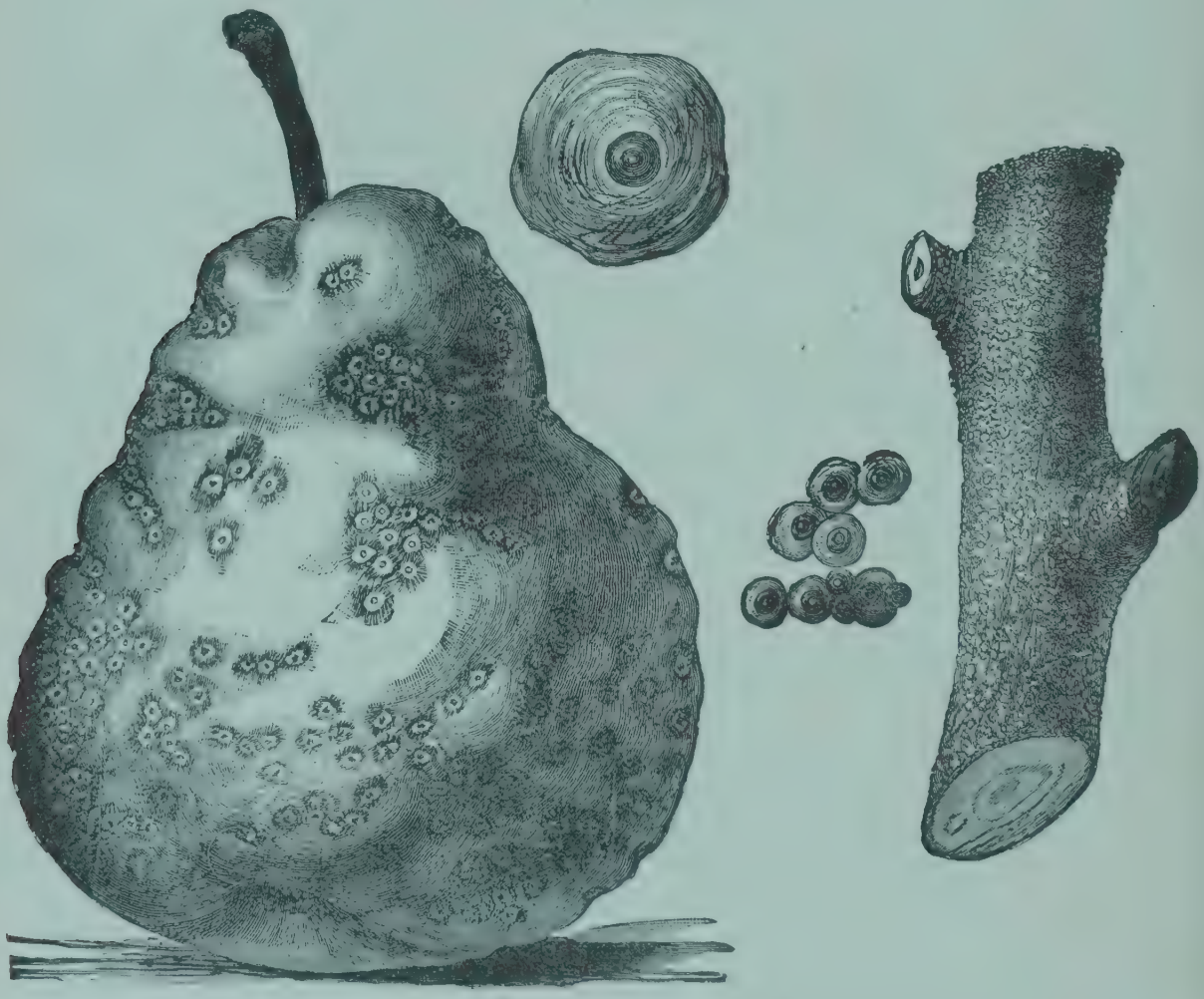

FIG. 2.—THE SAN JOSE SCALE.

Infested twig to right; immature scales in center; full-grown female scale above; infested pear fruit to left, showing reddish blotches.

WHERE TO FIND IT ON THE TREE.—We have already stated that the insect feeds by inserting its tiny beak into the bark and sucking out the sap. The young insects are so very small and delicate that they cannot settle well on old

tough bark, and on the other hand the very newest growth is so young that there are not likely to be many full-grown scales upon it, so that it is usually on the wood of last year and the year before, that the scales are most readily found, and in examining a tree for this insect we should examine especially wood of that age. Thus in inspecting nursery stock we would look on the trunk and on the larger branches, while in orchards we look on the two-year wood near the ends of the branches. Of course it may be found also on either the newer or older wood, but it is more often found on the one and two year growth.

The young insects in their search for a place where they can insert their tiny, delicate beaks, often settle on the fruit. If the fruit is green, whitish or yellow in color the infestation may be quite readily detected by the reddish blotches; but if the fruit be red, these will not show so plainly. Remember, however, that there may be reddish blotches or pimples on the fruits which are not caused by the San José Scale, and you should examine them closely to make sure.

The insects also show a decided tendency to settle close by, or under the buds, and at the rings which mark the end of a year's growth. In inspecting trees special attention should be given to these portions.

How Does the Scale Spread?—We have seen that the insect can only crawl about for a few hours after its birth, and that therefore it could only spread very slowly, and only during the breeding season, if it were entirely dependent upon its own powers. As a matter of fact, however, there are various outside agencies which aid them in spreading into new trees, new orchards, and new localities. Chief among these outside agencies are: (1) Wind, (2) Birds, (3) Insects, (4) Commerce in nursery stock. These, with its own limited natural powers, constitute its principal methods of spread. We will consider each of these separately, considering first its natural powers.

Natural Spread.—If one of the young insects should start out as soon as born and run as rapidly as it could until it became necessary for it to settle down and begin to feed, it could only travel a short distance, perhaps one or two rods. It is evident, therefore, that the vast majority of the young insects settle on the same tree on which they are born. If the trees are so set and pruned that the branches of separate trees do not interlock, it will be almost impossible for the young insects to get from one tree to another of their own accord, and this is an important point, for the spread of the scale in thickly-set orchards may be very materially lessened by keeping the branches so pruned that they shall not reach from one tree to another. But in spite of this, the insects will usually spread to the other trees more or less rapidly by other means.

Spread by Wind.—Notice that we have said that the young insects are very, very small; therefore, if a wind blows through the orchard during the breeding season (from April to December) the young crawling insects are liable to be blown about from place to place like particles of dust. Indeed, in almost every case where a large orchard becomes infested it is to be noted that it spreads most rapidly in the direction of the prevailing winds. Of course it is mere chance whether the young insects which are thus blown from one tree will find lodgment on another, and these winds no doubt leave many thousands to die on the ground. But it is perfectly evident that many are spread from tree to tree by this means.

Spread by Birds.—If a bird alights in a scale-infested tree at any time during the breeding season some of the young insects may crawl upon its feet or feathers and be carried off into other trees, there to crawl off again. There can be no doubt that they are often established on new trees in this way. We have frequently found in our inspections that the portions of a tree close around an old bird's nest may be thickly infested, while other parts may be slightly infested or almost entirely free from the insect. In towns and villages we have found similar evidence, the lower branches, next to the street or walk, being most frequently infested, thus indicating that the English sparrow plays an important part in its spread in such places.

Spread by Insects.—Insects play a part in the spread of this pest similar to that of the birds. Especially during the blossoming season, many insects are busy going from tree to tree and are thus liable to spread the young scale-insects.

Spread by Commerce in Nursery Stock.—All the means thus far considered contribute to the spread of the San José Scale to a limited extent—not more than a few miles at most. But by the shipment of infested trees from place to place the scale may be spread over great distances. If a nursery in Canada were infested and trees were ordered by a grower in North Carolina they would be dug and shipped, with scales attached, and the infestation would begin where the trees were planted.

We have seen that the insects have a tendency to settle near the buds. Now if a nurseryman desires to propagate a variety, it is done by cutting the buds and placing them in a young tree. If the tree from which the buds are taken be infested with scale, the nurseryman is likely to introduce the insect into his nursery, and then send it out to his customers on the trees which they purchase.

We can see, therefore, that although the San José Scale has very limited natural powers of spread it is nevertheless able to spread with considerable rapidity, aided, as it is, both by accidental causes and by the hand of man.

What Kinds of Plants May be Infested.—The San José Scale is not capable of living and thriving on all kinds of plants, and it is extremely important that the grower should know which ones are most liable to attack. It is primarily a pest of *orchard trees*, and it is an exception, rather than the rule, to find it on any other. Of the orchard fruits peaches, plums, apples, pears, and cherries seem to be worst attacked and die most readily, in the order named. Certain varieties, especially of pears, seem to show considerable resistance, the Keiffer, LeConte and Garber seeming to be less attacked than others, though by no means exempt.

Currants, gooseberries, roses, grapes, mock-orange and Japan walnut are all quite subject to the San José Scale, though not so readily attacked as the orchard fruits. Then there comes a long list of other plants upon which it is of accidental or of rare occurrence, such as persimmon, thorn-apple, walnut, poplar, chestnut, sumac, catalpa, willow, linden, ash, dog-wood, elm, maple, strawberry, raspberry, milk-weed, spruce, cedar, and even crab-grass. But it must be remembered that its occurrence on these last is unusual, and as a rule they are not attacked even though they stand close to orchard trees that are badly infested.

Forest and shade trees are very seldom infested with the San José Scale, and are not appreciable factors in harboring or spreading infection. Growers often make serious and ridiculous mistakes on this point and give up hope because

they imagine that the "scale is in the woods" or they try to destroy the forests which they suspect, or spend hours in a fruitless search for it on the forest or shade trees, and then, when they find a scale (which is some other species in nine cases out of ten) they think that they have surely found it.

Let us repeat, then, with greater emphasis, that *the San José Scale is primarily a pest of orchard fruit trees; it may also occur, but less frequently, on rose, grape, currant, gooseberry, mock-orange and Japan walnut, but forest and shade trees are not appreciable factors in harboring or spreading it.*

How Long Before it Kills the Tree?—The answer to this question will depend upon the kind of tree and the age at which it first becomes infested. Let us take some different examples: 1. If the tree becomes infested as soon as budded, peach and plum are likely to die within from one to two years; apple, pear and cherry in from two to four years. 2. If they become infested when five years of age, peach and plum will usually die in three or four years, pear in four or five years, and cherry and apple in four to six years, or perhaps not at all. 3. If they become infested at the age of eight years or over, our observation has been that apples are not likely to be killed outright, though peaches, plums and pears may be. Of course, an infested tree should be regularly and thoroughly treated whether it is going to be killed or not, for otherwise it becomes a center from which the scale may spread to other trees or orchards. Furthermore, though a tree may be too hardy to be killed outright, yet the younger branches where the fruit should be borne may be injured to such an extent that the tree cannot mature a crop.

Infested Counties in North Carolina.—At the time that this paper is being written (August 1, 1904) the San José Scale is known to exist in forty-four out of the ninety-seven counties in the State. There can be not the least doubt that it is in many, if not all, of the others, though we have not positive record of it. New cases are coming to our knowledge almost every week. Thus, in seven of these counties the scale was not known to exist at the beginning of this present year, and it is reasonable to suppose that a number of other counties will be added before the year is gone. In some of these counties the insect is only known on the premises of one or two individuals, while in other cases whole communities are known to be infested. The counties in which the scale is already recorded are: Alamance, Bertie, Burke, Cabarrus, Carteret, Catawba, Chatham, Cleveland, Cumberland, Davidson, Durham, Duplin, Edgecombe, Franklin, Forsyth, Gaston, Guilford, Halifax, Haywood, Henderson, Iredell, Jackson, Johnston, Lenoir, Lincoln, Mitchell, Moore, New Hanover, Person, Pitt, Polk, Randolph, Rockingham, Rutherford, Sampson, Scotland, Stanly, Surry, Wake, Watauga, Wayne, Wilkes, Wilson and Yadkin.

Natural Enemies of the San Jose Scale.—The orchardist is not entirely alone in his efforts to hold the San José Scale in check. There are a number of natural enemies which do more or less good in limiting the numbers of the pest. Every rainstorm during the summer doubtless washes off and drowns countless thousands of the young. There are at least two species of native Lady-beetles which commonly prey upon the scale. One of these is the Twice-stabbed Lady-beetle, about one-eighth of an inch long, black, and with a red spot on each wing-cover, the spots resembling tiny drops of blood, thus giving rise to its name. The other is called the Pitiful Lady-beetle, though we know not why unless it be on account of its small size, for this insect is not as large as a pin-head. It is jet black.

In addition to these there are one or more species of parasitic flies which attack the insects and lay their eggs within them, the eggs hatching into tiny maggots which feed within the scale-insects and eventually cause their death.

In Florida a fungous disease has been found to prey upon the scale to a considerable extent, but attempts to introduce this into other localities have not met with much success.

Recently the United States Department of Agriculture at Washington has introduced from China a species of Lady-beetle closely related to our "Twice-stabbed" species, and indeed one cannot easily tell one from the other. This also feeds upon the San José Scale, but thus far has not shown itself capable of holding it in practical control. We must still rely upon the spray pump if we wish to keep this pest in subjection.

History. Where did it Come From?—There has been much discussion in reports and bulletins as to the probable original home of the San José Scale. From present evidence, however, it seems most reasonable to suppose that it originated in northern China, and that from there it was introduced into California about 1870. The insect remained unknown to science, however, until 1880, when it was first described. At that time it was destructive in orchards in the Santa Clara valley near the city of San José (pronounced San Ho-zay), in California, and it is from that city that it has received its name.

The insect was not discovered in the eastern United States until August, 1893, or about eleven years ago. At that time it was found at Charlottesville, Va. It was soon found that the infested trees were purchased from certain nurseries which had been introducing stock from California. Then fruit-growers and entomologists began to inspect orchards especially for this pest, and in 1897, five years after its discovery in Virginia, it was known to exist in twenty States east of the Mississippi River.

It seems likely that it obtained a foothold in North Carolina about as soon as in Virginia, beginning at Southern Pines. Certain it is that it has been known in that vicinity since about 1897, and was probably there several years before it was recognized. At the present time it is widely disseminated in the State and no one can safely assume that his locality is free from it.

Name of the Insect.—It is worth while here to designate the proper pronunciation of the name of this pest. The name San José is of Spanish origin. The "San" is pronounced just as it is spelled. In the word "José" the "J" has the sound of "H," the "s" the sound of "z," and the "é" the sound of "ay." The proper way to pronounce the name of the insect is, therefore, as if it were spelled "San Ho-zay," with the accent on the last syllable.

Remedies.—Trees that are so badly infested by this pest that they are in dying condition should be dug out and burned as soon as the infestation is discovered, and it is especially important that they be not left standing during the breeding season, from March to December.

Trees which are infested but not in dying condition should be marked so that they may be readily recognized next winter. During the winter they should be thoroughly pruned and sprayed or washed with the lime-sulphur-salt wash, or Kerosene Emulsion at a strength of 20 to 50 per cent oil. Lime-sulphur-salt wash is by far the best and safest remedy and is fully discussed in Entomological Circular No. 5 of this series. The method of preparing and applying Kerosene Emulsion is given in Circular No. 10.

Conclusion.—In conclusion it may be said that the San José Scale is already so widely spread and so thoroughly established that it will never be exter-

minated in this or any other State. Nor is there the slightest need of its driving fruit-growers, or ordinary farmers, out of the business of growing fruit. At this time we have in the office of the Entomologist many reports from growers who state that their orchards, which were badly infested, are now in thrifty condition as a result of treating with the lime-sulphur-salt wash. Of course the insect is doubtless still present, but they have it within practical control. The treatment is not expensive nor difficult, and as one should spray his fruit trees anyway for other troubles, the cost of a good spraying apparatus is not great in view of the benefits derived.

The matter of controlling this pest depends solely upon the energy and intelligence of the grower whose orchard is infested. The State could not possibly undertake to treat the orchards, nor is it *possible* for the Entomologist to visit all the infested localities and compel treatment. If a man is too negligent to keep the scale in check it is just as well that his orchard should die, and the fruit-growing industry, in the long run, will be benefited by his retirement from the business.

Entomological Circular No. 12.

THE STRAWBERRY WEEVIL.

(*Anthonomus Signatus*, Say).

By Franklin Sherman, Jr., Entomologist,
and
R. W. Collett (Andrews, N. C.), Temporary Assistant.

Introduction.—A conservative estimate places the damage inflicted by the Strawberry Weevil in the spring of 1904 at $100,000 for North Carolina alone. Reports from growers in the strawberry section from Mount Olive to Wilmington and Chadbourn placed the loss at from 10 per cent to 50 per cent of the entire crop. Some have in other years reported an entire loss from certain varieties. Even though some of the reports may have been exaggerated, it is easily seen that an estimate as above given for 1904 is entirely within reason, and growers in the region where this pest abounds will doubtless think that the estimate is entirely too small. This pest was the subject of special investigation last spring, and we believe that the information gained from our own work, and a careful study of the work of others, justifies the publication of this circular.

We would urge our growers to at once put into active operation the suggestions which are here given for avoiding damage by this pest. Any or all of the methods mentioned can be profitably employed. Especially would we call attention to (1) the planting of varieties least affected; (2) the prompt mowing and burning over of fields after picking, and (3) the spraying with Bordeaux Mixture and Paris Green. This last method, while not of much avail against the weevil, will be found quite satisfactory against certain other insects and fungous diseases, and will contribute toward a more healthy growth of vines and correspondingly increased crop.

We regret the lack of illustrations for this circular, but believe that it is best to publish it at once rather than wait for cuts to be prepared.

Brief History of the Insect.—The Strawberry Weevil has been known as a pest in the strawberry-growing region of this State for the last four or five years, and seems to be rapidly gaining in numbers and destructiveness. It has at one time or another been destructive in most of the eastern States, especially north of North Carolina, and even in Canada.

Description of the Insect.—It is the mature, adult insect which does the damage, and, strange as it may seem, there are growers right in the midst of the weevil district and who have lost much money from its ravages, who have never yet learned the insect sufficiently well to recognize it positively and to distinguish it with certainty from other species. The adult beetle, viewed from above, is about as large as the head of a pin, but more elongated. It is of a chestnut-brown color and has on each side of the body a black spot, which is surrounded by a gray border. From the head there projects a snout of a little more than one-half the length of the body. Now it should be remembered that there are numerous other insects of about this same size, but these two points: (1) the black spots bordered with gray, one on each side of the

back, and (2) the snout, half as long as the body—these two points, taken together with the general chestnut-brown color of the insect, should enable any intelligent, keen-eyed observer to recognize it with certainty.

Character of Injury.—The injury by this insect consists in depositing eggs within the unopened buds and then severing the bud-stalk (pedicel), so that the buds wilt and finally drop to the ground. In this way one female insect will often destroy many buds. We have counted as high as eighty cut buds on a single hill. The eggs are deposited almost exclusively in the buds of varieties that bear pollen, although other varieties are attacked to some extent. We are inclined to believe, however, that when the imperfect blooming varieties are attacked it is "by mistake," so to speak, on the part of the insect.

Life-history of the Insect.—Last spring the authors of this circular were able to make quite extended observations on this insect, our principal field of operations being at Wallace, although we also visited Chadbourn, Lake Waccamaw, Rocky Mount, Mount Olive and other points in the course of the investigation. In this way we were able to corroborate many points in the life-history of the insect which had been recorded (or intimated) in the writings of others, and added some original and valuable observations of our own. It is necessary that the grower should have a thorough knowledge of the life-history and habits of the insect in order to fight it to the best advantage.

The adult weevils were first observed on March 31st. On April 4th Mr. Collett found them abundant, mating, laying eggs and cutting the buds. On April 12th we found that the eggs were hatching to tiny, white, footless grubs inside the buds, which by this time were falling. On June 5th Mr. Collett found that the grubs were transforming to pupæ (still inside the buds), and that many of the pupæ had developed into adult beetles, which had emerged. *At that date (June 5th) adults, pupæ and grown larvæ were still abundant in the field, although the last picking for the season had been some two weeks previous. Here, then, had been two weeks when the vines were useless that the insects were coming to maturity undisturbed.* We will see later what may be done at that time.

Although adults were numerous at Wallace on June 5th, Mr. Collett did not find them mating, but he did find many of them on the flowers of certain wild plants in the woods, especially the gall-berry. In fact, at that time (June 5th) the whole trend of movement seemed to be from the fields, where the weevils were maturing, to the woods. There were no efforts being made to provide for another generation. Indeed, it seems to be pretty well established now that there is only one annual generation of the weevil, namely, those that reach maturity just after the picking season. Therefore, the same adult weevils which Mr. Collett found migrating to the woods on June 5th will come forth from their winter quarters next spring to cut the buds. From the time that the egg is laid until the adult emerges, the entire life of the growing insect is spent in the very bud in which the egg is laid. The larva (grub) does not go from one bud to another, and there is no time when it enters the ground. It is always in that bud in which it hatches from the egg.

Food and Other Habits.—The principal food of the insect, both in the beetle and grub state, is pollen; hence it attacks the pollen-bearing varieties (the "perfect bloomers") much more than the others. The adult insects can fly freely, although they seldom seem to do so; the usual mode of escape being to simply double up the legs and roll or drop to the ground. It does not "jump," as some suppose. The adult beetles may be found feeding on the pollen of a

large number of flowers, but they only seem to deposit eggs in and cut a few, principal among which are the strawberry, blackberry, dewberry, red-bud, cinque-foil and rose. We found the adult insects mating, depositing eggs and cutting the buds of roses growing on the porch of the Boney House at Wallace. on April 28th.

Hibernation.—As yet it is impossible to say definitely just how and where the insects pass the winter. It seems certain that they winter in the adult stage, and it also seems certain that they hibernate around the edges of the field or in the woods, but *exactly where*, whether in stumps, rotten logs, under trash, rubbish and leaves, or under the surface of the ground, remains a question. Two whole days of careful search at Warsaw and Rocky Point (on March 9th and 10th), looking under bark, sifting dirt, trash, pine-straw, etc., failed to throw any light on this question, for, although a considerable number of other insects were found, no evidence of weevil was to be seen. From careful observation and search, it seems positive that they are not brought into the fields in the pine-straw, for if that were the case they would appear at once wherever the pine-straw is spread out, but they do not do this. We have carefully sifted over a good deal of the straw, both in the woods, in the piles where it had been all winter, and in the field after it had been distributed, without finding any trace of the weevils. There is yet opportunity for some enterprising grower to fill this gap in our knowledge of this pest. Should any one find the insect in the winter season, he should at once carefully pack up specimens and send them to the Entomologist at Raleigh, with letter stating where and when they were found.

Distribution in North Carolina.—Reports and observations only show this pest to be present in this State in the principal strawberry section, from Mount Olive southward to Wilmington, and thence westward to Chadbourn. We have found blackberry buds at Hamlet in Rockingham County which had been cut in such a way as to leave practically no doubt that it was the work of this insect, although we failed to find the insects themselves. At Wilson, Wilson County, Mr. Collett also found blackberry buds cut in the same way, although he did not find adult insects. It is not known to occur at Raleigh. The Continental Plant Company at Kittrell, Vance County, informs us that it is not known there, and Mr. D. M. Stanton of La Grange, Lenoir County, says that it is not known in his vicinity.

So far as we have absolute *proof*, then, the pest is only in the district to the south of Goldsboro and east of Chadbourn, but there is some *evidence* that it may be present, though not destructive, in all the district south of Wilson and east of Hamlet. It is doubtless mostly confined to the country adjacent to the main lines of railroad in this region, and these have no doubt played some part in distributing it. So far as the matter of climate is concerned, there seems to be no reason why it should not live in any part of North Carolina, though it is not likely to arouse apprehension except in districts where the strawberry is grown as a commercial crop.

REMEDIES.

General Remarks.—In our work at Wallace, Mr. Collett made practical applications of nine different treatments on our little experimental plat on the place of Mr. J. A. Westbrook. The experiments included "spirittine," air-slaked lime, Bordeaux Mixture and Paris Green, carbolic acid and water,

whale oil soap in water, and others. Others have tried such remedies as kerosene emulsion, tobacco dust, etc., so thoroughly that we did not feel it necessary to repeat their work. Our experiments demonstrated one thing thoroughly—that there is little or no hope of ever securing any direct remedy. On all rows, no matter what treatment was applied, the weevil was seriously and about equally destructive. Both the carbolic acid solution and the spirittine solution were used at so great strength as to seriously burn the foliage on some plants, yet with absolutely no result on the weevil. The vines sprayed with the Bordeaux Mixture and Paris Green were no doubt protected to some extent from rust and leaf-eating beetles, but the treatment did not mitigate weevil injury in the least. We see no hope of any material being used as a spray or dust application which will be of material benefit, and we are positive in the conviction that the best results will be secured through (1) the planting of the imperfect blooming varieties; (2) the prompt mowing and burning over of fields as soon as picking is over; (3) the burning of trash, and especially of ditch banks overgrown with dewberries; (4) spraying with Bordeaux Mixture and Paris Green; (5) clean culture, and (6) trap crops. Let us now consider these more in detail.

1. Planting Imperfect Bloomers.—The insect attacks chiefly the perfect-blooming varieties, although they sometimes attack the others also. The varieties at present most extensively grown in the strawberry section are: (1) Excelsior, (2) Thompson, (3) Heflin, (4) McKinley, (5) Duff, (6) Dixie Belle, (7) Profit. Of these, the first four are perfect bloomers, and are hence fully liable to attack. The last three are imperfect bloomers, and therefore are not so much attacked. It seems impossible to produce an imperfect-blooming berry which will mature fruit as early as the first perfect varieties, for which reason those who have been growing the very early Excelsiors, McKinleys and Thompsons do not like to change to the later Duff, Dixie Belle and Profit. The imperfect bloomers are likely to be shy bearers, especially in wet seasons. On this the grower must take his chances. It is for him to choose whether he will continue to invite the weevil with the perfect bloomers, or escape it by using the imperfect ones and run his risk on the short crop. If he will depend mainly on the imperfect bloomers, such as Duff, Dixie Belle and Profit, he will at once do away with a great deal of the weevil difficulty. It must be remembered that the weevil *does* attack the imperfect varieties, but not nearly so much as it does the others. We conceive this to be the chief means of avoiding injury.

2. Mowing and Burning Fields.—In the field of Thompsons, in which our experiments were conducted, picking ceased about May 20th to 25th, yet the insects were abundant in larval, pupa and adult stages on June 5th. If that field had been mowed over at the last picking and the whole burned as soon as the vines had dried a little, countless thousands of the insects would have been killed. Mowing might not be necessary if some of the pine-straw be left to burn.

There are two principal objections to burning over the fields: (1) the scarcity of pine-straw, which must be left in the field to make burning possible, and (2) the liability of injury to the vines. Fortunately, both these objections can be met in large measure. With regard to the straw, half of it might be raked up and saved and the other half scattered over the field. If the mowed tops were sufficiently dry they would take the place of some of the straw. Oat or rye straw might be scattered over the field if it is more easily

spared than the pine. With regard to the injury to the vines, Mr. Milton Southerland of Wallace informs me that he finds that the burning "has a decidedly beneficial effect if not too severe." Dr. E. Porter of Rocky Point gives me similar information. It remains, then, to burn so as to kill the insects, yet not be too severe for the plants, and yet be as saving of the pine-straw as possible. By raking off and saving a portion of the straw and scattering and burning the remainder, the desired end should be easily accomplished, but it must be remembered that the insects when disturbed drop to the ground, so that the burning will have to be pretty thorough to secure best results. Many larvæ, pupæ and adults will be in buds on the ground, and they must at least be roasted, even if the fire does not actually burn them. Co-operation among all the growers of a vicinity in this burning-off process will be essential to secure best results. Old fields from which the last crop has been gathered should be burned severely, plowed deeply and at once sowed to peas or other crops.

3. Burning of Trash, etc.—Ditch-banks and borders of fields which are overgrown with blackberries, dewberries, etc., should be kept burned off. It might be well to use them as a sort of trap for the weevils, allowing them to remain until the buds are much cut by the weevils, and then burn them off thoroughly to kill all the insects, eggs, etc., that may be present.

4. Spraying with Bordeaux and Paris Green.—We have already stated that this does not have much effect upon the weevil, but it does have a very beneficial effect in promoting the general vigor of the plants, causing them to be more profuse in growth and fruitage, and thus offsetting in some degree the damage by the weevil. Besides, it is entirely effective in controlling leaf rust and the little black beetle which eats round holes in the leaves. Our growers have neglected the spraying of their fields too much, and it will certainly pay to adopt it as a regular practice. From two to four treatments should be given. Formula for making the preparation will be sent to any one on application to the Entomologist, Raleigh, N. C. The material is the same as that recommended from this office (see Entomological Circular No. 9) for Potato Beetles.

5. Clean Culture.—The general clean culture of all strawberry fields has often been recommended as a means of dealing with this pest. Our growers are exceptionally clean in their system of culture, but it will do no harm to remark that the cleaner the better, so far as keeping this insect in check is concerned.

6. Trap Crop.—But suppose that the grower does not wish to change his varieties. Or, even if he does, how will he keep his pollenizers from being entirely wiped out by the weevil? To this we answer that the strawberry is so profuse in its blooming that there will seldom be difficulty in securing sufficient pollen.

But why not make use of an early and profuse bloomer (like Excelsior or McKinley) to trap the adults when they first emerge in the spring? Let us suppose that you have a field of Thompsons—consider this plan: Plant around the outside of that field two or three rows of Excelsior or McKinley. Next to the woods, if one borders the field, plant at least a half-dozen rows. Now, when these rows begin to bud and bloom, the adult weevils which first invade the field will be at once attracted to them. Then as soon as the main crop of Thompsons is fully set, and before the insects have spread over the field, add more dry straw to the outside trap rows and burn vines, straw, buds, insects

and all. This plan will help to some extent, but will not be found so good as it might first appear, for some of the Thompsons will bloom early and thus invite the weevil, or the weevils may not begin to emerge until the Thompsons are in full bloom, in which case the trap would do no appreciable good. But you can easily see the idea involved, and if it be carefully followed some good would surely be accomplished. But it must be emphasized that if the trap rows are left without being burned, then they simply invite more weevils to your field than would otherwise come, and "your last state will be worse than the first."

Co-operation.—The *best* results in fighting this insect can only be secured when all the growers in a community act in concert and all follow the same plan. The individual efforts of one man in a community of careless neighbors will not yield the results that they would if his neighbors would also follow the same system. However, we have no doubt that any grower can to a large extent protect his crop by following the recommendations we have given. *It will be well for each man to make the fight, but it will be better if all fight together.*

WHAT WE MUST CONSIDER IN GROWING FARM CROPS.

Economy in raising live-stock means the production of all roughage materials on the farm. It is possible to purchase all roughage material and yet make a financial success of growing farm animals, but it is not likely, nor is it reasonable or sensible to do so. In deciding what forage and grain crops to grow the farmer should consider—

1. The crops in relation to soil and climate.
2. The crops in relation to line of business.
3. The home production of protein.
4. The growing of crops that have power of producing greatest quantity of digestible dry matter.
5. Soil improvement in relation to crops grown.

1. *Crops in Relation to Soil and Climate.*

Farm crops are not equally adapted to all soils and climates. Cotton seed cannot be produced in the North because of the cooler and shorter seasons. Timothy and blue-grass are most productive in cool, limestone soils, and cow-peas are more at home in warm, dry soils.

Nature has been generous, however, and has looked after the matter of crops and grasses quite carefully. If we but do our part there will be no difficulty in providing all roughage materials necessary for the successful production of live-stock.

Our aim should be to make the best use of what we have; to improve by selection and care those species best adapted to our soil and climate; and by better methods of cultivating, growing and curing secure still greater yields and better returns at the cheapest cost of production.

This does not mean we shall refuse to try new plants and endeavor to adapt them to our peculiar conditions. We should not, if they are no better than what we have. If a new plant is found of peculiar value to our environments and business, let us endeavor to bring it to our service by all means. But let us hold on to our old friends till we have tried the new and are sure the change is no mistake.

2. *Crops in Relation to Line of Business.*

A farmer necessarily becomes a specialist. He gathers those classes of animals about him which he likes best and finds most profitable. He will do the same with the crops for carrying on his business. The silo, for instance, is necessary for the highest success in dairying. Succulent food must be furnished throughout the year. The silo, then, is the winter pasture field.

Soiling crops should be provided to supplement the summer pastures when they become dry and parched. Fattening cattle need good-sized corn-fields for stover and grain.

The successful farmer of to-day and of the future will have at his hand the use of crops and methods for his special particular purpose.

The ordinary farmer will go on in the same old way, and continue to say "Farming does not pay."

3. *The Home Production of Protein.*

The Experiment Station has given us positive evidence of the importance of protein for all classes of farm animals. The gist of the matter is, we have been feeding too little protein because the ordinary farm crops are deficient in this constituent, and we have found out only recently how and where it can be obtained. The discovery shows that protein costs money. To balance feeding rations properly we have been obliged to purchase large quantities of grains and concentrates to supply the needed protein.

To bring the purchased amount of protein down to the minimum quantity is one of the most important questions before the feeder to-day. This can be done to a very great extent by growing those crops having relatively high percentage of protein, such as cow-peas, clover, vetches, soja beans and alfalfa. There are a few others like these, but those named are the most important, and two or more can be grown readily in every section of our country. Alfalfa, cow-peas and clover have already been grown in the East, South and West, and long since have passed the experimental state. Following is a ration almost wholly home-grown, and furnishes the necessary digestible nutrients in proper quantity and proportion for a dairy cow in full flow of milk, and costs for an outside purchase less than three cents per day for each cow:

HOME-MADE RATION FOR DAIRY COW.

Feeding Stuff.	Dry Matter.	Digestible Nutrients.		
		Protein.	Carbohydrates.	Fat.
Cow-pea hay, 15 lbs.	13.50	1.62	5.79	.16
Corn stover, 10 lbs.	5.95	.17	3.24	.07
Corn ensilage, 30 lbs.	6.27	.27	3.39	.21
Cotton-seed meal, 2 lbs.	1.87	.74	.33	.24
Total	27.59	2.70	12.75	.68

If timothy hay had been used in place of cow-pea hay several pounds of meal and bran would have been required to furnish the protein to balance the ration, and supply the deficiency in the roughage feeding materials.

Clover and alfalfa are almost as nutritious from the standpoint of protein and can be used in the same way. Every farmer should consider well the bearing this fact has upon feeding principles, for with it may lay success or failure. He can at least be assured that with its practice greater profit will result.

4. *Growing Crops for Greatest Quantity Digestible Nutrients.*

We are prone to call a crop a crop without considering its productive capacity. This is a mistake; especially when it is not a source of protein supply. It should be our policy to grow such crops as are heavy producers. When we consider the matter in this way we see that one acre often produces as many pounds of digestible nutrients as two acres of some other crop.

The following table arranged by Dr. Jordan gives us a vivid explanation in this respect:

Feeding Stuff.	Yield Per Acre Fresh Manured.	Dry Matter.	Dry Matter Per Acre.	Dry Matter Digestible.	Digestible Dry Matter Per Acre.
	Pounds.	Per Cent.	Pounds.	Per Cent.	Pounds.
Alfalfa	35,000	25	8.750	69	5.162
Indian corn	30,000	25	7.500	61	5.025
Red clover	18,000	30	5.400	57	3.070
Oats and peas	20,000	16	3.240	65	2.106
Timothy	11,000	38.44	4.416	57	2.517

It is readily seen from the table that alfalfa and corn produce nearly twice as much digestible nutrients as timothy, which is of considerable importance, especially when good tillage land is not readily available.

5. *Soil Improvement in Relation to Crops Grown.*

A good farmer should always be thinking of improving his soil. This is wise not only for posterity, but immediate crop production as well.

Crops that may be termed soil depleters should be grown as infrequent as possible. Since the leguminous crops add nitrogen to the soil and at the same time are the best sources for protein supply, it follows they should receive primary attention in every system of crop rotation. We want crops that will furnish largest quantities of needed nutrients and at the same time improve the soil.

The clovers, the cow-pea and alfalfa will be more extensively grown in the future and will occupy a much more important place in every system of farming.

CHAS. W. BURKETT.

ALFALFA.

Alfalfa has become the great forage plant of the western plains, where it succeeds as it has not heretofore succeeded in the eastern part of the country. I experimented with alfalfa, or lucerne, as it was then called, over forty years ago, and then came to the conclusion that it was not suited to our eastern conditions. Year after year experiments were made in the eastern part of the country, and here and there some one seemed to succeed with it. But nine out of ten who tried it failed. In later years the wonderful success of the plant in the West brought about a new interest in it in the eastern part of the country. The experiment stations had been organized and took up the study of the reasons for the failure of the crop in the East. Gradually, and almost by accident, as a rule, the conditions for success became apparent. Some years ago I was visiting the grass and forage experiment farm belonging to Peter Henderson & Co., the great seed firm of New York. Among other large plots I noticed a very luxuriant one of alfalfa. It was growing on a fertile alluvial soil, a sort of second bottom above the Hackensack River. Asking how they had succeeded so well with it, I was told that the first year after sowing the plot was very poor and hardly kept alive. The following

spring they were hauling lime past it to land higher up the hill and some jolted out on the corner of the alfalfa. That corner at once shot up into a luxuriant growth, and, noticing this, the whole plot was limed over, and was cut several times during the season I saw it. I made a note of this for future use. The following winter I was in company with Mr. J. E. Wing, of Ohio, a noted sheep feeder. Mr. Wing spoke in regard to his success in building up a farm in Ohio by means of growing alfalfa and feeding sheep in winter. He had gradually gotten nearly all of a 150-acre farm in alfalfa. Wishing to learn more in regard to the plant, I not only made notes of Mr. Wing's lectures on the subject, but questioned him closely. He said that the principal reason for failure in the East had been that the plants grow very feebly the first season where sown in the spring, and are apt to be smothered by weeds and die out about midsummer. He said that he always sowed it broadcast in the spring and without any nurse crop. Then, as soon as tall enough to catch the mower, it was mown off and let lie. Later on it will be found turning yellow; and must be mown again at once or it will die. He clips his off two or three times during the first season and gets in this way strong stools that send long tap roots down below any danger from dry weather. He promised also to try the lime and thought it was doubtless a good thing, as he has since found to be true. It is useless to sow alfalfa on a soil underlaid by a compact hard-pan, or on land where the permanent water comes within less than four feet of the surface. The best lands for alfalfa in the South are what are known as second bottoms, land well above floods and still of a semi-alluvial character and fertile. The subsoil must be of such a mellow nature as to be easily penetrated by the long tap roots. Then, for the best success, the soil must be inoculated with the special microbe that lives on the roots of alfalfa, for unless these are there the plant will have to be dressed heavily with stable manure or other nitrogenous manure. When the microbes form nodules freely on the roots the plants can get nitrogen for themselves from the air. On the fertile soils of Illinois it was found necessary to manure the alfalfa on lands that had not become inoculated with the nitrogen-collecting organisms that are parasitic on the roots of the plants. In the South the seed should always be sown in August or September. Weeds will be less in the way at that time, and full crops can be cut the following season. A farmer in Alamance wrote recently that on a piece of land that had been well fertilized and sown in peas and crimson clover he sowed alfalfa in August last, and by the last of November it was about a foot high. When such a condition occurs it will be best to mow it in the fall. The following spring before vegetation starts well the alfalfa should have a dressing of freshly-slaked lime, at rate of about ten bushels per acre. Then as soon as a blossom can be noticed here and there, mow the first crop. If let run on and into bloom, the plants will be weakened and the subsequent crops will be smaller. Therefore, mow the hay as soon as signs of blooming show. It can be cut from three to five times on strong land, and it should go on no other sort. An annual dressing of acid phosphate and potash mixed in proportion of 1,800 pounds of acid phosphate to 200 pounds of muriate of potash to make a ton will be all right, provided the plants have formed the root nodules. If not, then some nitrogenous fertilizer should be used, such as stable manure, if it can be had. It will always pay to treat the crop liberally in the way of fertilization. Alfalfa can be grown with success in all parts of this State when put on the proper soil

and properly treated. If sown in the spring, the very life of the crop depends on its being mown two or three times during the summer so as to strengthen the stools and to keep down the weeds. A North Carolina farmer, in the summer of 1901, wrote to me that he had a good stand of alfalfa, but that it was turning yellow. I wrote to him to mow it off at once. He did so and saved the plants. This mowing of the young spring-sown crop must be made as soon as the weeds get started and before there is anything there to take off as a crop. If this mowing is neglected the crop is lost entirely. Sown in late summer or early autumn, the crop will pay for making hay several times the following season, especially if the lime is not neglected.

Alfalfa is not a crop that can be taken into a rotation of farm crops. It will occupy the land for many years, and hence should have a rich lot to itself where it will not interfere with the regular farm rotation. For a short rotation of crops and the production of the finest forage, while improving the soil at the same time, there is no plant that can for our purposes compare with the cow-pea. Alfalfa is for a permanent mowing and has the same relation to the farm crops that an asparagus bed has to the rest of the garden.

W. F. Massey.

SILOS IN NORTH CAROLINA.

By C. C. Moore.

The silo has saved and made more money for me than any one thing I have used in connection with dairy and farm. My first silo was built on a brick wall 3 feet in the ground, round, 16 feet in diameter, 2 by 4 22-foot pine staves dressed and beveled, hooped with eight hoops ⅝-inch round iron. It is a good job, cost $80 complete, been in use six years and silage keeps perfectly. Built by carpenter. No. 2 is 18 feet in diameter, 2 by 4 22-foot staves, on wall 6 feet deep; built by farm hands, of lumber just as from saw, not dressed or beveled. It is an ugly thing, but for five years the silage has kept as good as that in the first one. No. 2 cost $65 complete. No. 3 is different, filled one time and contents came out sweet and bright. This one stands on circular wall 2 feet high. On the wall four 4 by 4 by 22 pieces were first put up as corner posts. These were plumbed and braced true; 18 inches from these 2 by 4 22-foot scantling were placed all around on the wall flush with inside of wall. Lime-barrel staves were tacked from corner post to upright, continuing all around—one course 3 feet from wall and one as high as tallest man could reach. This framing was ceiled on inside with ½ by 6 by 16. Fencing plank was bought and ripped at lumber yard. Two courses, or double ceiled, the second course broke seams of first course. It is a substantial building, cheap, and less trouble to build than the stave and hoop kind. No. 3 cost $55 and carpenter two days. Will build No. 4 this summer just like No. 3, but will not need carpenter. No. 3 will have a stable for cows built around it this summer, and, I think, will be the cheapest barn a man can build. My buildings are roofed with plank. Roof is no use, except to keep out snow. If ground is level a 1-foot wall is better than to go deep down; 16 by 22 is best size; a 30-foot tall silo is unhandy to fill, unhandy to feed from and handy for

wind to blow over. I have seen a number of these tall 25 to 30-foot ones; I do not care for the job of filling or feeding from them. Any farmer who has 20 head of stock should have silage. He can build silo 10 by 22, 12 by 22, or any size to fit his stock. Can build for small amount of money and no investment will pay him so much dividend. There are many cutters, of many sizes. I have used several makes and sizes. All do good work. If I have to fill a 10 by 22 silo I would buy an 11-inch knife, 24-foot elevator, 2-horse lever power. I would haul corn two days, pile near knife, then cut one day, and so on until the tub was full. If there are three or four silos to fill get a 16-inch knife with blower. Use steam power, hire teams to haul and go at the job in a big way. There is plenty to do when one undertakes filling three or four big tubs. Corn, sorghum, peas, soy beans, corn-field beans, are all good fillers for a silo. We grow quite a lot of sorghum, because it outgrows corn in dry time. To save my life I cannot tell which plant is best for silage. The cows tell me it is all good; they are the jury, the verdict is plenty of milk when silage made of any of above is fed. Any reliable corn that grows in your section is the best to plant. Any sorghum will grow anywhere that corn will. Soy beans grow anywhere that cow-peas do. There is no want for a crop to grow for silo. Fancy farmers can build expensive tubs, but ordinary, every-day fellows like myself, will do well to use the $50 to $75 buildings, and our cows will enjoy their ration just as much as if from a $500 tub. Build your tub and fill it; it will pay you and cause cows to smile.

Mecklenburg County, N. C.

THIRD REPORT ON FOOD PRODUCTS FOR 1902.

GENERAL STATEMENT AND SUMMARY OF RESULTS.

By B. W. Kilgore, State Chemist.

The General Assembly of the State passed what is generally known as the "Pure Food Law" in February, 1899. This law went into effect on the first day of August of the same year. The first and second reports on the examination of food products under this law were made in the Bulletins of the Department for December, 1900, and September, 1902. The results of the third year's work are presented on the following pages. For the benefit and information of those who are interested in and not familiar with the law, it is thought well to again reproduce it in full:

An Act to Prevent the Sale of Adulterated and Misbranded Food.

The General Assembly of North Carolina do enact:

Section 1. That for the purpose of protecting the people of the State from imposition by the adulteration and misbranding of articles of food, the Board of Agriculture shall cause to be procured from time to time, and under rules and regulations to be prescribed by them in accordance with section 9 of this act, samples of food, beverages and condiments offered for sale in the State, and shall cause the same to be analyzed or examined, microscopically or otherwise, by the chemists or other experts of the Department of Agriculture. The Board of Agriculture is hereby authorized to make such publications of the results of the examinations, analyses and so forth as they may deem proper.

Sec. 2. That no person, by himself or agent, shall knowingly manufacture, sell, expose for sale, or have in his possession with intent to sell, any article of food which is adulterated or misbranded within the meaning of this act; and any person who shall violate any of the provisions of this act shall be guilty of a misdemeanor, and for such offense shall be fined not exceeding two hundred dollars for the first offense, and for each subsequent offense not exceeding three hundred dollars, or be imprisoned not exceeding one year, or both, in the discretion of the court; and such fines, less legal costs and charges, shall be paid into the treasury of the State for the benefit of the Department of Agriculture, to be used exclusively in executing the provisions of this act.

Sec. 3. That the chemists or other experts of the Department of Agriculture shall make, under rules and regulations prescribed by the Board of Agriculture, examinations of specimens of food, beverages and condiments offered for sale in North Carolina which may be collected from time to time under their directions in various parts of the State. If it shall appear from such examination that any of the provisions of this act have been violated, the Commissioner of Agriculture shall at once certify the facts to the proper solicitor and furnish that officer a copy of the result of the analysis, duly authenticated by the analyst, under oath.

SEC. 4. That it shall be the duty of every solicitor to whom the Commissioner of Agriculture shall report any violation of this act to cause proceedings to be commenced and prosecuted without delay for the fines and penalties in such cases provided.

SEC. 5. That the term "food," as used herein, shall include all articles used for food, candy, condiment or drink, by man or domestic animals, whether simple, mixed or compound. The term "misbranded," as herein used, shall include all articles of food or articles which enter into the composition of food, the package or label of which shall bear any statement purporting to name any ingredients or substances as being contained or not being contained in such article, which statement shall be false in any particular.

SEC. 6. That for the purpose of this act an article of food shall be deemed adulterated—

First. If any substance or substances has or have been mixed or packed with it so as to reduce or lower or injuriously affect its quality or strength so that such product when offered for sale shall deceive or tend to deceive the purchaser.

Second. If any inferior substance or substances has or have been substituted, wholly or in part, for the article, so that the product when sold shall deceive or tend to deceive the purchaser.

Third. If any valuable constituent of the article has been wholly or in part abstracted, so that the product when sold shall deceive or tend to deceive the purchaser.

Fourth. If it be an imitation of and sold under the specific name of another article.

Fifth. If it be mixed, colored, powdered, coated, polished or stained in a manner whereby damage or inferiority is concealed, so that such product when sold shall deceive or tend to deceive the purchaser.

Sixth. If it contain any added poisonous ingredient or any ingredient which may render such article injurious to the health of the person consuming it.

Seventh. If it be labeled or branded so as to deceive or mislead the purchaser, or purport to be a foreign product when branded so, or in an imitation either in package or label of an established proprietary product which has been trade-marked or patented.

Eighth. If it consists of the whole or any part of a diseased, filthy, decomposed or putrid animal or vegetable substance, or any portion of an animal unfit for food, whether manufactured or not, or if it is the product of a diseased animal or of an animal that has died otherwise than by slaughter.

Ninth. That candies and chocolate may be deemed to be adulterated if they contain terra alba, barytes, talc, chrome yellow, or other mineral substances or poisonous colors or flavors, or other ingredients deleterious or detrimental to health: *Provided*, that an article of food, beverage or condiment which does not contain any added poisonous ingredient shall not be deemed to be adulterated in the following cases:

First. In the case of articles, mixtures or compounds which may be now or from time to time hereafter known as articles of food, beverages or condiments under their own distinctive names and not included in definition fourth of this section.

Second. In the case of articles labeled, branded or tagged so as to plainly indicate that they are mixtures, compounds, combinations, imitations or blends.

Third. When any matter or ingredient has been added to the food, beverage or condiment because the same is required for the production or preparation thereof as an article of commerce, in a state fit for carriage or consumption, and not fraudulently to increase the bulk, weight or measure of the food, beverage or condiment, or conceal the inferior quality thereof: *Provided*, that the same shall be labeled, branded or tagged as prescribed by the Board of Agriculture, so as to show them to be compounds and the exact character thereof: *And provided further*, that nothing in this act shall be construed as requiring or compelling proprietors or manufacturers of proprietary foods to disclose their trade formulas, except in so far as the provisions of this act may require to secure freedom from adulteration or imitation: *Provided further*, that nothing in this act shall be construed to apply to proprietary or patent medicines.

Fourth. When the food, beverage or condiment is unavoidably mixed with some harmless extraneous matter in the process of collection or preparation: *Provided further*, that no person shall be convicted under the provisions of this act when he is able to prove a written guaranty of purity in a form approved by the Board of Agriculture, as published in their rules and regulations, signed by the wholesale jobber, manufacturer or other party from whom he purchased said article.

Sec. 7. That the Board of Agriculture is hereby authorized to cause all compound, mixed or blended products to be properly branded, and prescribe how this shall be done.

Sec. 8. That it shall be the duty of the Board of Agriculture to prepare and publish from time to time lists of the articles, mixtures or compounds declared to be exempt from the provisions of this act, in accordance with section 6. The Board of Agriculture shall also from time to time fix and publish the limits of variability permissible in any article of food, beverage or condiment, and these standards, when so published, shall remain the standards before all courts: *Provided*, that when standards have been or may be fixed by the Secretary of Agriculture of the United States they shall be accepted by the Board of Agriculture and published as the standards for North Carolina.

Sec. 9. That every person who exposes for sale or delivers to a purchaser any condiment, beverage or article of food shall furnish, within business hours and upon tender and full payment of the selling price, a sample of such condiments, beverages or articles of food to any person duly authorized by the Board of Agriculture to secure the same, and who shall apply to such manufacturer or vender or person delivering to a purchaser such beverage or article of food for such sample for such use, in sufficient quantity for the analysis of such article or articles in his possession.

Sec. 10. That any manufacturer or dealer who refuses to comply, upon demand, with the requirements of section 9 of this act, or any manufacturer, dealer or person who shall impede, obstruct, hinder or otherwise prevent or attempt to prevent any chemist, inspector or other person in the performance of his duty in connection with this act, shall be guilty of a misdemeanor, and shall, upon conviction, be fined not less than ten dollars nor more than one hundred dollars, or be imprisoned not more than one hundred days, or both, in the discretion of the court, and said fines, less legal costs, shall be paid into the treasury of the State for the benefit of the Department of Agriculture, to be used exclusively in executing the provisions of this act.

SEC. 11. That this act shall not be construed to interfere with commerce or any interstate commerce laws of the United States.

SEC. 12. That chapter one hundred and twenty-two, Public Laws of one thousand eight hundred and ninety-five, be and the same is hereby repealed.

SEC. 13. That this act shall be in force from the first day of August, one thousand eight hundred and ninety-nine.

Ratified the 13th day of February, A. D. 1899.

DUTIES OF THE DEPARTMENT UNDER THE FOOD LAW.

This law either authorizes or directs the Board of Agriculture—

1. To collect and make examination of food and drink for man and beast, and publish the results. (Sec. 1.)

2. When adulteration, misbranding, or other violation is evident, the facts are to be certified to the proper solicitor, who shall prosecute without delay for fines and penalties. (Secs. 3 and 4.)

3. To cause all mixed, compound, or blended products to be properly branded, and to prescribe how this shall be done. (Sec. 7.)

4. To fix standards of strength, quality and purity. (Sec. 8.)

5. To publish list of articles exempt from the provisions of the act.

STANDARDS AND RULINGS OF THE BOARD OF AGRICULTURE RELATING TO FOOD UNDER THE PURE FOOD LAW.

Rulings have been made regarding the subject of branding or labeling and preservatives, and a form of guarantee provided as required in section 6 of the law. Standards have been fixed for a considerable number of food products. Others will be made later. The following subjects have been covered, and the attention of merchants is especially called to these rulings and standards:

Vinegar.—To be standard, vinegar shall contain not less than four per cent of acetic acid. When of less strength, the percentage of acetic acid must be branded on every package in which it is sold, exposed or offered for sale. Vinegar must not contain any preparation of lead, copper, sulphuric acid or other ingredient injurious to health, and when artificially colored the fact shall be made known by a proper label (as designated under paragraph on "Labeling") attached to every package in which it is sold, exposed or offered for sale.

Apple Cider, or Orchard Vinegar, must be made from the pure juice of apples, free from foreign substances, and must contain not less than 1½ per cent of apple cider solids.

Other Vinegars must be sold under names which represent truly the material or materials from which they are severally made, as "Malt Vinegar," "Grape Vinegar."

All fermented and not distilled vinegars must contain not less than 1½ per cent of the solids of the grains or fruits from which they are made.

Distilled Vinegar must be labeled and sold as such.

Milk.—Milk must be from healthy cows and must contain at least 12 per cent of total solids and 3 per cent of butter fat, unless labeled or sold as "skimmed milk," or milk below standard. Coloring matter or preservatives must not be added unless the cans from which the milk is sold are conspicu-

ously labeled to show such addition and written notice is served on each customer stating the kind and amount of coloring matter or preservative, or both, used to the gallon.

Butter.—Butter must contain not less than 80 per cent of milk fat, without admixture of any other animal or vegetable fats.

Renovated Butter.—Deteriorated or unmarketable butter, which by any process or remelting or working over has been made marketable, must be branded and sold as "*Renovated Butter*," and each package so sold, offered or exposed for sale must be labeled so as to fairly and clearly furnish this information.

Oleomargarine.—Oleomargarine, butterine and kindred mixtures of animal and vegetable fats, or mixtures of these with butter, must be sold under their own distinctive names, as Oleomargarine or Butterine, and each package so sold, offered or exposed for sale must be so labeled (as prescribed under paragraph headed "Labeling") as to furnish clearly and fairly this information.

Cheese.—Cheese not made wholly from pure, unskimmed milk or cream must be sold as "Skim-milk Cheese," and where other fats have been added it must be sold as "Filled Cheese," and each cheese must be so labeled as to furnish this information, as directed under the labeling paragraph.

Lard.—Lard is the rendered fat of swine, and should contain not less than 9 per cent of this fat. Other fats and oils, and mixtures of them, must be sold under their true names or coin names, or as "lard substitutes." An admixture of other fat or fats with a considerable percentage of lard may be sold as "lard compound," otherwise it must be sold as adulterated lard.

Oils.—Oils, as olive and cotton-seed, must be sold under their true names, or under names that will not mislead as to their true character; and when mixed or blended, the fact shall be made known by proper and conspicuous labeling on the containing vessels; otherwise they must be branded and sold as "adulterated."

Spices and Peppers.—Spices and peppers must be pure and true to name, and must not be mixed with other substances or with exhausted or impure articles of their own kind, unless labeled and sold as adulterated.

Mustard.—Dry mustard must be pure. Mixtures of mustard, vinegar and spices may be sold as "Prepared Mustard," but must not be diluted with starch or other materials unless the fact is made known on the label.

Ciders and Fruit Juices.—These must be made of unadulterated fruit juices and be sold under the name of the fruit from which made. No preservative, color or flavor shall be added unless the fact is made known by proper label attached to each package. When artificially colored or flavored, or both, they must be sold as "adulterated" or "imitation" products, in which case any added preservative must be made known by proper label.

Beers and Wines and other Alcoholic and Non-alcoholic Drinks and Products used in making such must not contain added preservatives, coloring or flavor unless the fact is made known by proper label on each package. When made partly or entirely from artificial products, they must be sold as "adulterated" or "imitation" products, any added preservative being made known on proper label.

Cereal and Farinaceous Products.—Flour, cracked and rolled wheat, oats, buckwheat, barley and corn, and their products, rice, etc., must be true to name, and when mixed with each other or with other vegetable or mineral

products the mixtures must be sold under coin names or as mixtures or compounds.

Canned Goods.—Canned goods must be true to name and be free from added coloring, flavor or preservatives, unless such addition or additions are made known by conspicuous labeling.

Candy.—Candy must not contain terra alba, kaolin or other mineral substances or harmful coloring or other matter.

Fruit Jellies, Butter, Jams, Preserves, Conserves, Confections and like articles must be made entirely of the fruit specified on the label, and preserved only with cane sugar, and must not contain any artificial coloring, preservatives or flavor except spices or other wholesome natural flavoring materials, unless such added flavors, coloring and (or) preservatives are made known on the labels. When made partly or wholly of artificial materials, or when any material to make up bulk or weight, to add flavor or color, except as indicated as above, have been used, the products must be sold as "adulterated" or "imitation" products, in which case any added preservatives must be made known on the label.

Honey must not have added to it, directly by man, or indirectly by feeding to the bees, glucose, cane sugar, invert sugar or other matter not naturally occurring in pure honey, unless sold as adulterated honey, or a statement regarding the adulterations made a part of the label attached to each package sold.

Coffee.—Coffee must be true to name and of full strength. It must not be mixed with exhausted or partially exhausted coffee, or any other substance or substances, except as indicated below. If mixed with chicory or other harmless substitute allied to coffee in either flavor or strength, and not used simply as an adulterant, the mixture may be sold as "Coffee Compound."

Imitations or substitutes containing no coffee must not be sold as coffee compounds, but may be sold under coin names.

Tea.—Tea, when sold, exposed or offered for sale as such, must consist wholly of the dried leaves of the true tea plant, without artificial color, filler or extraction of essential properties, unless conspicuously labeled as "adulterated."

Baking Powders.—Baking powders must not contain substances not necessary to their manufacture, and they must be labeled in a conspicuous way and place, either in the name of the powder itself or elsewhere, so as to show the acid salt of which the powder is made, as "Alum Baking Powder." "Alum-phosphate Baking Powder," "Phosphate Baking Powder," or "Cream of Tartar Baking Powder," and when so labeled they must be true to label.

Preservatives.—The term preservative is considered synonymous with antiseptic. Food containing any added antiseptic or preservative substance or substances, except common table salt, saltpetre, cane sugar, alcohol, vinegar, spices, or the natural products of the smoking process, shall have the presence of such preservative or preservatives made clearly known by conspicuous labeling, or made known to purchasers when the article is not capable of being labeled.

Labeling.—A label must be, as far as possible, attached to each package, and contain, in addition to other information, the name and address of the manufacturer or jobber. When the words "artificial," "imitation," "compound," "adulterated," or words of similar import, are required, they must immediately precede or follow the word or words they modify, and be in the same size

and style of type and on the same kind of background as the word or words with which they are closely associated.

Where the presence of preservatives, coloring matter or other substance or substances is required to be printed on the label, as indicated in the several paragraphs relating to different food products, the printing must be done clearly and conspicuously on the label, in type not smaller than *brevier heavy gothic caps*, and on the same kind of background as the rest of the label.

FORM OF GUARANTY OF PURITY APPROVED BY THE BOARD OF AGRICULTURE, AS PROVIDED FOR IN SECTION SIX OF THE PURE FOOD LAW.

I (or we), the undersigned wholesaler, jobber, or manufacturer, in consideration of (name and address), retail merchant, purchasing food from us, hereby guarantee that all food sold to ..... shall be pure, within the meaning of what is known as the Pure Food Law (An Act to prevent the Sale of Adulterated and Misbranded Food), ratified the 13th day of February, 1899, and shall conform with the requirements of said law and the Standards and Rulings of the Board of Agriculture as regards standards of quality, branding, and otherwise. This guaranty to remain in force till revoked in writing.

The article referred to in this guaranty is (or are) .....

.....

Signed .....

Address .....

Date ....

GENERAL STATEMENT.

The Department of Agriculture desires the co-operation and support of manufacturers, jobbers, wholesalers, retailers and individuals in carrying out the provisions of the Pure Food Law. To this end the Department

(1) Invites suggestions and will give hearings to interested parties regarding the present Standards and Rulings, others that may seem desirable or that may be made in the future.

(2) Analyses will be made for parties within the State when samples are taken in accordance with instructions furnished by the State Chemist and the required data concerning the samples are given.

(3) Analyses will be sent to parties sending samples, and to parties from whom samples are taken by the Department. It is the desire of the Department to put information into the hands of manufacturers, dealers and users of food, and to assist them in every way it can to know and manufacture, handle and use the best, most desirable and most wholesome food products. The Pure Food Law is in the interest of the honest manufacturer, the honest dealer, and for the protection of the consumer. It should operate in this way.

SAMPLES EXAMINED IN 1902.

Five hundred and eighty-nine (589) samples of foods and drinks for man and beast were collected by agents of the Department or sent by individuals and analyzed chemically and microscopically during 1902.

These samples were obtained in the number indicated, from the following towns in the State:

PLACES AT WHICH SAMPLES WERE OBTAINED, AND NUMBER OBTAINED AT EACH PLACE.

Biltmore	10
Charlotte	67
Elizabeth City	22
Greensboro	134
Goldsboro	6
Greenville	18
Kinston	2
Lumberton	9
New Bern	7
Raeford	5
Raleigh	73
Salisbury	63
Washington	18
Wilmington	15
Wilson	10
Winston	51
Tarboro	16
Miscellaneous	63
Total	589

KIND AND NUMBER OF SAMPLES ANALYZED.

Baking Powders	12
Butter and Butterine	22
Canned Fruits and Vegetables	118
Cheese	33
Ciders, Malts and Bitters	12
Commercial Stock Feeds	162
Compound Lard	24
Condimental Stock Feeds	18
Corn Meal	17
Flour	70
Lard	32
Mustards and Salad Dressings	11
Non-alcoholic Summer Drinks	36
Tomato Catsups and Sauces	22
Total	589

SUMMARY OF RESULTS.

In our first report on the examination of food products (for 1900) the results of the analyses of 507 samples were included, the amount of adulteration being 56 per cent; and the second report (for 1901) contained the results of the chemical and microscopic tests of 308 samples, 110 of which, or 35.7 per cent, were found to be in some way sophisticated.

The present report (for 1902) on 589 samples collected in 17 towns in the State and sent in by a considerable number of town officials and individuals shows 87 samples, or 21.3 per cent, to be adulterated in some way. The classes of products examined in 1902 were: Baking powders, butter and oleomargarine, canned fruits and vegetables, cheese, ciders, malts and bitters, lard and lard compounds, corn meal, flour, summer drinks, catsup and sauces, salad and other dressings, commercial stock feeds, and condimental stock feeds, the results being summarized in the table below.

The amount of decrease in adulteration in three years, presumably the effect of the operations of the food law, is little less than remarkable, and reinforces the statement made in the previous report that dealers and manufacturers are seeking information as to our law, standards and rulings, and expressing a desire to make their products comply with all requirements. In this way, and through the distribution of information regarding the brands of adulterated foods in our food reports, a great deal of good has already been done in an educational way—the very best way—and a foundation laid, we feel, for a gradual bettering of the food products on our markets.

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS FOR 1902.

	Total Number Samples.	Not Found Adulterated.	Found Adulterated.	Per Cent Adulterated.
Baking powders	12	12		
Butter and butterine (oleomargarine)	22	22		
Canned fruits and vegetables	118	102	16	13.5
Cheese	33	31	2	6.0
Corn meal	17	17		
Compound lard	24	24		
Flour	32	31	1	3.1
Lard	70	69	1	1.4
Non-alcoholic summer drinks	36	10	26	72.0
Phosphates, malts, ciders and bitters	12	3	9	75.0
Prepared mustard and salad dressings	11	1	10	90.9
Tomato catsup and sauces	22		22	100.0
Total human foods	409	322	87	21.3
Commercial stock feeds	162			
Condimental stock feeds	18			
Total	589			

Attention is directed to the article on commercial stock feeds for the condition of these products as sold on our markets.

For convenience of comparison of the work for the three years, and to show at a glance the products which have been examined, and the extent of adulteration of each, the tables of summary results are given below for 1900 and 1901:

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS FOR 1900.

	Total Number Samples.	Not Found Adulterated.	Found Adulterated.	Per Cent Adulterated.
Beers and other alcoholic drinks	35	8	27	77.14
Breakfast foods	24	23	1	4.17
Butter	11	11		
Canned asparagus	9	2	7	77.77
Boston baked beans	1		1	100.00
Celery	2		2	100.00
Corn	70	28	42	60.00
Corn and tomatoes	4		4	100.00
Garden peas	37	7	30	81.00
Lima beans	8	3	5	62.50
Okra	2	1	1	50.00
Okra and tomatoes	8		8	100.00
Pumpkins	8	4	4	50.00
Snap beans	9	2	7	77.77
Succotash	14	13	1	7.14
Tomatoes	55	20	35	63.63
Catsups	36	1	35	97.22
Flour	37	37		
Lard	11	10	1	9.00
Non-alcoholic summer drinks	33	9	24	72.72
Oil	11	9	2	18.18
Sauces	7	1	6	86.00
Vinegar	22	9	13	59.00
Total human foods	454	187	256	56.04
Commercial stock feeds	53			
Total	507			

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS FOR 1901.

	Total Number Samples.	Not Found Adulterated.	Found Adulterated.	Per Cent Adulterated.
Baking powders	85	69	16	18.8
Coffee	55	35	20	36.3
Condiments	44	35	9	20.4
Jams, fruit-butters and preserves	25		25	100
Jellies	10		10	100
Molasses, syrups and honey	32	6	26	81.2
Sugar	19	19		
Tea	25	25		
Vinegar	13	9	4	30.7
Total	308	198	110	35.7

Total samples of all kinds examined in three years, 1,404.

On the following pages are detailed the results of the analyses of the several classes of foods, credit being given in each case to the chemists who did the laboratory work, the discussions being generally the combined work of the analyst and the State Chemist.

CANNED FRUITS AND VEGETABLES.

By W. M. Allen.

The subject of canning vegetables, and the adulteration of the same, was discussed in the first food report of this Department, published December, 1900. Only the important points will, therefore, be mentioned in connection with this investigation.

The advantages to be gained in canning fruit and vegetables are so evident that it is hardly necessary to mention them here. It insures a supply during seasons when they cannot be had from the orchards, gardens and fields, and enables people to have them at a reasonable cost where they are not grown.

The process of canning consists, in brief, in cleaning and otherwise preparing the fruit and vegetables, placing them in the cans, heating at high enough temperature and long enough to kill all of the fermentative germs in the articles. The vessel is then sealed to prevent the admission from the air of other organisms which would produce decay. The reason for the above process is simple. It is a plain fact that most vegetable and fruit products, when ripe and taken from the plant upon which they grow, soon begin to decay. This decay or breaking-up of very complex substances into simpler ones is due to the activity of exceedingly minute living organisms. They are the lowest form of living

things and exceedingly small. They multiply with marvelous rapidity, and the usefulness of many of these bacteria in destroying accumulated vegetable and animal matters is very great. The destruction of these organisms insures the indefinite keeping of such substances. As stated above, by sufficient heat these organisms are killed, and sealing the can prevents the entrance of others from the air.

If a tightly sealed can of goods spoils it shows that all the organisms of decay were not killed by the heating in the canning process.

The organisms that cause the decay of some vegetable and some animal substances can stand heat at a higher degree and of longer duration than others without destruction, and for that reason higher temperature and longer time is required to can some substances than others.

Preservatives.—Preservatives are preventives of decay, whether it be fermentation or putrefaction of animal and vegetable substances. They operate by destroying the life or suspending the activity of the decay-producing organisms and the spores out of which they develop. To guard against the possibility of not having killed all of the organisms by heat, and to shorten the heating process in canning, which tends to destroy the attractive appearance of the fruits or vegetables, these chemical preservatives are often employed.

It is well to bear in mind that the process of digestion of food for the nourishment of the body is brought about by living organisms, which, as regards life, habits and susceptibility to the action of preservatives, are similar to the organisms which produce decay in animal and vegetable substances. If these chemical preservatives will destroy the activity of organisms out of the body, they will within, and to a greater or less extent impair the digestive process. These organisms which bring about decomposition are really poisoned by the antiseptics employed to prevent decay, and were the quantity of antiseptic large enough it would have a similar effect upon the human being. The power of different persons, apparently well, to overcome the evil action of preservatives is very various. Some suffer apparently no inconvenience from amounts which seriously hinder or disturb the health of others. Each person is more or less a law unto himself in this regard, and to avoid discomfort and ill health he must find out what he can eat with satisfaction and what he should avoid. This becomes impossible if his food contains antiseptics that he cannot at once recognize. On account of these, and of the admitted fact that food products can be preserved without the use of them where proper precautions are observed, medical authorities generally condemn the use of preservatives.

The preservatives generally used in canned goods are salicylic acid, benzoic acid, boric acid, sulphurous acid, and formaldehyde.

RESULTS OF EXAMINATION.

Of the samples of canned vegetables examined by the Department in 1900, 66.5 per cent contained some chemical preservative. Of the samples of vegetables and fruit examined this year, only 13.5 per cent are found to contain chemical preservatives. It is gratifying to see the wonderful decrease in the use of these chemical preservatives since the passage of the *Pure Food Law*, and it is hoped that they will disappear altogether.

In saying that these samples of fruit and vegetables are found adulterated or not adulterated, there is no reference to the quality of the material. The finest and best selected fruit and vegetables, and therefore commanding the higher price, might be artificially preserved, and therefore classed adulterated by the Pure Food Law of the State.

CANNED PEACHES NOT

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Where Purchased.
1003	Lemon Cling	G. H. Waters & Co., Pomona, Cal.	Barnes, Overman & Co., Wilson, N. C.
1007	Lotus Brand	Githens, Rexsamer & Co., Philadelphia, Pa.	do
1017	Republic	Austin, Nichols & Co., New York	I. B. Fonville, Goldsboro, N. C.
1019	Scanta Brand	Sanders & Chambers, Richmond, Va.	A. E. Cummings, Kinston, N. C.
1023	Regina Brand	Visala Preserving Co., Visala, Cal.	E. B. Hackburn, New Bern, N. C.
1032	Jumbo Brand	Miller Bros. & Co., Baltimore, Md.	E. K. Willis, Washington, N. C.
1034	Rialto	Rialto Packing Co., San Francisco, Cal.	J. L. Starkey & Bro., Greenville, N. C.
1035	Regina	Visala Preserving Co., Visala, Cal.	do
1036	Anchor	Anchor Brand Packing Co., San Francisco, Cal.	do
1437	Golden Harvest	G. H. Waters & Co., Pomona, Cal.	Rankin Bros. Grocery Company, Greensboro, N. C.
1436	Mountain Rose	Githens, Rexsamer & Co., Philadelphia, Pa.	do

CANNED PEACHES

1435	Lotus	Githens, Rexsamer & Co., Philadelphia, Pa.	Rankin Bros. Grocery Company, Greensboro, N. C.
1438	Herald	do	do
1439	Dessert	Cude Bros., Colfax, N. C.	Hiatt & Lamb, Greensboro, N. C.

CANNED PEARS NOT

1016	Clipper Brand	Wm. Numsen & Son, Baltimore, Md.	I. B. Fonville, Goldsboro, N. C.
1009	Bartlett	Githens, Rexsamer & Co., Philadelphia, Pa.	Barnes, Overman & Co., Wilson, N. C.
1025	New World Bartlett.	J. E. Taylor, Santa Clara, Cal.	E. B. Hackburn, New Bern, N. C.
1038	Bartlett	Houghton Packing Co., Baltimore, Md.	J. L. Starkey & Bro., Greenville, N. C.
1543	Banquet	Taylor Bolling Co., Richmond, Va.	E. P. Grizzard, Winston, N. C.

CANNED PEARS

1443	Mountain Rose	Githens, Rexsamer & Co., Philadelphia, Pa.	Rankin Bros. Grocery Company, Greensboro, N. C.
1444	Lake View	Argo Packing Co., Cal.	Hiatt & Lamb, Greensboro, N. C.

CANNED APPLES NOT

1010	Bull Dog Brand	E. Robinson & Co., Baltimore, Md.	Barnes, Overman & Co., Wilson, N. C.
1037	Clipper	Wm. Numsen & Son, Baltimore, Md.	J. L. Starkey & Bro., Greenville, N. C.

METHODS OF EXAMINATION.

The methods used in this work are those of the Association of Official Agricultural Chemists.

FOUND ADULTERATED.

Date of Purchase.	Laboratory Number.	Packed for.	Actual Weight of Package.	Weight of Contents of Package.	Retail Price of Package.	Cost per Lb. of Material.	Preservative.	Condition of Contents.
		Lbs.	Lbs.	Lbs.	Cts.	Cts.		
July 19, 1900	1003	2.5	2.3	2.0	25	12.5	----------	Good.
----do ----------	1007	1.0	1.2	1.0	15	15	----------	do.
----do ----------	1017	2.5	2.3	2.0	30	15	----------	do.
July 18, 1900	1019	2.5	2.4	2.0	25	12.5	----------	do.
July 19, 1900	1023	2.5	2.3	2.0	25	12.5	----------	do.
----do ----------	1032	2.5	2.3	2.1	25	11.9	----------	do.
July 20, 1900	1034	2.5	2.3	2.0	25	12.5	----------	do.
----do ----------	1035	2.5	2.0	1.8	25	14	----------	do.
----------	1036	2.5	2.3	2.0	25	12.5	----------	do.
Sept. 10, 1902	1437	2.5	2.2	2.0	25	12.5	----------	do.
Sept. 16, 1902	1436	2.5	2.3	2.0	40	20	----------	do.

FOUND ADULTERATED.

Sept. 16, 1902	1435	2.5	1.2	1.0	15	15	Formaldehyde.	Good.
----do ----------	1438	2.5	2.3	2.0	30	15	----do ----------	do.
----do ----------	1439	2.5	2.3	2.0	12.5	6.2	----do ----------	do.

FOUND ADULTERATED.

July 16, 1900	1016	2.5	2.4	2.1	25	11.9	----------	Good.
July 12, 1900	1009	2.5	2.6	2.2	20	9.0	----------	do.
July 18, 1900	1025	2.5	2.4	2.1	35	16.7	----------	do.
July 20, 1900	1038	2.5	2.5	2.1	20	9.0	----------	do.
Sept. 18, 1902	1543	2.5	2.4	2.1	20	9.5	----------	do.

FOUND ADULTERATED.

Sept. 16, 1902	1443	2.5	2.6	2.3	35	15.2	Formaldehyde.	Good.
----do ----------	1444	2.5	2.2	1.9	20	10.5	Formaldehyde.	do.

FOUND ADULTERATED.

July 12, 1900	1010	2.5	2.2	1.9	15	7.9	----------	Good.
July 20, 1900	1037	2.5	2.2	1.9	15	7.9	----------	do.

CANNED PINEAPPLE NOT

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1013	Excelsior	Austin, Nichols & Co., New York	I. B. Fonville, Goldsboro, N. C.
1445	Robin Hood	R. C. Williams & Co., New York	Rankin Bros. Grocery Company, Greensboro, N. C.
1446	Clipper	Wm. Numsen & Son, Baltimore, Md.	Hiatt & Lamb, Greensboro, N. C.

CANNED APRICOTS

1029	Santa Clara	Los Gatos Canning Co., Los Gatos, Cal.	E. B. Hackburn, New Bern, N. C.
1028	Santiago	Butte Packing Co., Chapman, Cal.	----do
1027	Columbus	Fontana & Co., San Francisco, Cal.	----do
1026	Riverton	Vacaville Canning Co., Vacaville, Cal.	----do
1442	Columbus	Fontana & Co., San Francisco, Cal.	Rankin Bros. Grocery Company, Greensboro, N. C.

CANNED APRICOTS NOT

1001	Hesperian	Hayward's Canning Co., Hayward, Cal.	Barnes, Overman & Co., Wilson, N. C.

CANNED CHERRIES NOT

1008	Lotus Brand	Githens, Rexsamer & Co., Philadelphia, Pa.	Barnes, Overman & Co., Wilson, N. C.
1440	Old Homestead	Bennett, Shaw & Co., New York City	Rankin Bros. Grocery Company, Greensboro, N. C.

CANNED CHERRIES

1441	Standard	Fleming & Co., Baltimore, Md.	S. E. Hudson, Greensboro, N. C.

CANNED BLACKBERRIES NOT

1472	Popular Brand	Wm. Fait Co., Baltimore, Md.	Fletcher & Rhodes, Greensboro, N. C.
1473		Cude Bros., Colfax, N. C.	S. E. Hudson, Greensboro, N. C.

CANNED TOMATOES

1520	Oxford	Armstrong & Arthur, Oxford, Pa.	Fletcher & Rhodes, Greensboro, N. C.
1525	----do	D. B. Arthur, Oxford, Pa.	D. M. Miller, Salisbury, N. C.
1532	Mountain City		Miller & Campbell, Charlotte, N. C.
1533	----do		McManus, Sharp & Co., Charlotte, N. C.
1527	Oxford	Armstrong & Arthur, Oxford, Pa.	Hall & Griggs, Salisbury, N. C.
1535	Mountain City		E. M. Smith, Raleigh, N. C.

FOUND ADULTERATED.

Date of Purchase.	Laboratory Number.	Packed for.	Actual Weight of Package.	Weight of Contents of Package.	Retail Price of Package.	Cost per Lb. of Material.	Preservative.	Condition of Contents.
		Lbs.	Lbs.	Lbs.	Cts.	Cts.		
July 25, 1902	1013	2.0	1.6	1.3	25	19.2	----------	Good.
Sept. 16, 1902	1445	1.5	1.7	1.5	25	16.6	----------	do.
----do ----------	1446	1.5	1.5	1.2	20	16.7	----------	do.

FOUND ADULTERATED.

July 18, 1900	1029	2.5	2.7	2.4	20	8.3	Formaldehyde--	Good.
----do ----------	1028	2.5	2.2	2.0	20	10.0	----do ----------	do.
----do ----------	1027	2.5	2.5	2.1	25	12.0	----do ----------	do.
----do ----------	1026	2.5	2.5	2.1	35	16.0	----do ----------	do.
Sept. 16, 1902	1442	2.5	2.3	2.0	30.	16.0	----do ----------	do.

FOUND ADULTERATED.

July 12, 1900	1001	2.5	2.3	2.0	25	12.5	----------	Good.

FOUND ADULTERATED.

July 12, 1900	1008	1.0	1.3	1.0	15	15.0	----------	Good.
Sept. 16, 1902	1440	2.0	2.4	2.0	35	17.5	----------	do.

FOUND ADULTERATED.

Sept. 16, 1902	1441	1.0	1.4	1.0	10.	10.0	Formaldehyde--	Not good.

FOUND ADULTERATED.

Sept. 16, 1902	1472	1.5	1.4	1.2	10	8.3	----------	Good.
----do ----------	1473	2.0	2.3	1.9	10	8.2	----------	do.

FOUND ADULTERATED.

Sept. 16, 1902	1520	2.5	2.5	2.1	12	5.7	Formaldehyde--	Good.
Sept. 19, 1902	1525	2.5	2.5	2.1	15	7.1	----do ----------	do.
Sept. 20, 1902	1532	2.5	2.5	2.2	12.5	5.7	----do ----------	do.
----do ----------	1533	2.5	2.5	2.2	15	6.8	----do ----------	do.
Sept. 19, 1902	1527	2.5	2.5	2.1	15	7.1	----do ----------	do.
Sept. 25, 1902	1535	2.5	2.5	2.2	10	4.5	----do ----------	do.

CANNED TOMATOES NOT

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1518	----------	Bethany Industrial Canning Co., McLeansville, N. C.	Rankin Bros. Grocery Company, Greensboro, N. C.
1519	Our Special	Garner Bros., Village, Va.	do
1521	Bolling's Best	Taylor & Bolling, Richmond, Va.	A. P. Grizzard, Winston, N. C.
1522	Wolf Island	W. H. Schoolfield, Reidsville, N. C.	Griffith & Lentz, Winston, N. C.
1523	Iron Bridge	George H. Graybill, Brugh's Mills, Va.	W. L. Harger, Winston, N. C.
1524	Monumental	Wm. Taylor & Son, Baltimore, Md.	Nash & McGehee, Winston, N. C.
1526	Oval	A. B. Booth & Co., Baltimore, Md.	Ruffity & Misenheimer, Salisbury, N. C.
1539	Herald	Githens, Rexsamer & Co., Philadelphia, Pa.	M. Rosenthal, Raleigh, N. C.
1528	Benville	A. S. Benville & Co., Ridge, Md.	M. Moses, Salisbury, N. C.
1529	Avalon	Harrington Packing Co., Harrington, Del.	Bridgers & Co., Charlotte, N. C.
1530	Jupiter	Luke F. Smith, Elmer, N. J.	J. R. Van Ness & Bro., Charlotte, N. C.
1531	Benville	A. S. Benville & Co., Ridge, Md.	W. L. Pope, Charlotte, N. C.
1534	Baby Brand	Apex Canning Co., Apex, N. C.	Miller & Campbell, Charlotte, N. C.
1536	do	do	E. M. Smith, Raleigh, N. C.
1537	Oakford	Oakford, Md.	do
1538	Peacock	Roberts Bros., Baltimore, Md.	B. W. Jones, Raleigh, N. C.
1540	Baby Brand	Apex Canning Co., Apex, N. C.	M. Rosenthal, Raleigh, N. C.
1541	Peacock	Roberts Bros., Baltimore, Md.	B. W. Upchurch, Raleigh, N. C.
1542	Peninsula	Satterfield & Bros. Canning Company, Greensboro, Md.	Old & Fearing, Elizabeth City, N. C.

CANNED CORN NOT

1544	Sunbeam	Austin, Nichols & Co., New York City	Old & Fearing, Elizabeth City, N. C.
1545	Country Gentleman.	R. C. Williams & Co., New York City	do
1546	Auburn Sweet	Oxford Packing Co., Portland, Me.	Fulmer & Whitehurst, Elizabeth City, N. C.
1547	Eden Valley	Barbour & Perkins, Philadelphia, Pa.	do
1548	Dew Drop	The Paul Taylor-Brown Co., New York City.	Rankin Bros. Grocery Company, Greensboro, N. C.
1549	White Lily	Githens, Rexsamer & Co., Philadelphia, Pa.	do
1550	Commonwealth	Taylor & Bolling Co., Richmond, Va.	do
1551	Webb's Cream Oriental Sugar.	H. F. Webb & Co., Portland, Me.	do
1552	Garden	The Paul Taylor-Brown Co., New York City.	do
1553	Rich Cream	Camden Packing Co., Camden, N. Y.	Hiatt & Lamb, Greensboro, N. C.
1554	Worlumbo	Minot Packing Co., West Minot, Me.	do
1555	Whiteford Prospect.	W. Scott Whiteford, Whiteford, Md.	Fletcher & Rhodes, Greensboro, N. C.
1556	Rich Cream	Camden Packing Co., Camden, N. Y.	S. E. Hudson, Greensboro, N. C.
1557	Manhattan	Manhattan Canning Co., New York City.	J. R. Foster & Co., Greensboro, N. C.
1558	Princess Anne	United Canneries Co., Whitehaun, Md.	do
1559	Gold Cord	A. V. Lane, Taberg, N. Y.	A. P. Grizzard, Winston, N. C.
1560	Pride of the Valley	Frederick City Packing Co., Frederick City, Md.	C. L. Sharp, Winston, N. C.

FOUND ADULTERATED.

Date of Purchase.	Laboratory Number.	Packed for.	Actual Weight of Package.	Weight of Contents of Package.	Retail Price of Package.	Cost per Lb. of Material.	Preservative.	Condition of Contents.
		Lbs.	Lbs.	Lbs.	Cts.	Cts.		
Sept. 16, 1902	1518	2.5	2.5	2.1	10	4.7		Good.
----do ----------	1519	2.5	2.5	2.1	10	4.7		do.
Sept. 17, 1902	1521	2.5	2.5	2.1	15	7.1		do.
----do ----------	1522	2.5	2.5	2.1	15	7.1		do.
----do ----------	1523	2.5	2.5	2.2	15	6.8		do.
----do ----------	1524	2.5	2.5	2.2	15	6.8		do.
Sept. 18, 1902	1526	2.5	2.5	2.2	15	6.8		do.
Sept. 25, 1902	1539	3.0	3.2	2 7	20	7.4		do.
Sept. 19, 1902	1528	2.5	2.5	2.2	15	6.8		do.
Sept. 20, 1902	1529	2.5	2.5	2.1	10	4.7		do.
----do ----------	1530	3.0	3.2	2.7	18	6.7		do.
----do ----------	1531	2.5	2.5	2.2	10	4.5		do.
----do ----------	1534	2.5	2.5	2.1	12.5	6.0		do.
Sept. 25, 1902	1536	2.5	2.5	2.1	12.5	6.0		do.
----do ----------	1537	2.5	2.5	2.2	12.5	5.6		do.
----do ----------	1538	2.5	2.5	2.1	15	7.1		do.
----do ----------	1540	2.5	2.5	2.1	15	7.1		do.
----do ----------	1541	2.5	2.5	2.2	10	4.6		do.
Sept. 15, 1902	1542	2.5	2.5	2.2	12.5	5.7		do.

FOUND ADULTERATED.

Sept. 15, 1902	1544	2.0	1.5	1.3	10	7.7	
----do ----------	1545	2.0	1.5	1.3	13	10.0	
----do ----------	1546	2.0	1.6	1.3	10	7.7	
----do ----------	1547	2.0	1.6	1.3	10	7.7	
Sept. 16, 1902	1548	2.0	1.6	1.3	10	7.7	
----do ----------	1549	2.0	1.5	1.3	10	7.7	
----do ----------	1550	2.0	1.6	1.4	10	7.1	
----do ----------	1551	2.0	1.7	1.4	12	8.6	
----do ----------	1552	2.0	1.6	1.3	15	11.5	
----do ----------	1553	2.0	1.6	1.3	10	7.7	
----do ----------	1554	2.0	1.6	1.3	12	9.2	
----do ----------	1555	2.0	1.5	1.2	10	8.4	
----do ----------	1556	2.0	1.6	1.3	10	7.7	
----do ----------	1557	2.0	1.5	1.3	10	7.7	
----do ----------	1558	2.0	1.6	1.3	10	7.7	
Sept. 18, 1902	1559	2.0	1.6	1.3	10	7 7	
----do ----------	1560	2.0	1.6	1.3	10	7.7	

CANNED CORN NOT

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1561	Emerald	Pennellville Canning Co., Pennellville, N. Y.	S. O. Bennett, Winston, N. C.
1562	Mountain Rose	Githens, Rexsamer & Co., Philadelphia, Pa.	Griffith & Lentz, Winston, N. C.
1563	St. Elmo	Highshirer Canning Co., Highshirer, N. Y.	do
1564	Emerald	Pennellville Canning Co., Pennellville, N. Y.	W. L. Harger, Winston, N. C.
1565	Arctic	Frederick Packing Co., Frederick City, Md.	Nash & McGehee, Winston, N. C.
1566	Morning Glory	Northern Maine Packing Co., Corinna, Me.	do
1567	White Cap	G. W. Antrim & Son, Richmond, Va.	D. M. Miller, Salisbury, N. C.
1568	Nabob	F. H. Leggett & Co., New York	Theo. Atwell, Salisbury, N. C.
1569	Premier	do	C. J. Jeffries, Salisbury, N. C.
1570	Commonwealth	Taylor & Bolling Co., Richmond, Va.	do
1571	Westmoreland	Somerset Packing Co., Fruitland, Md.	Ruffity & Misenheimer, Salisbury, N. C.
1572	Blue Wing	Thomas & Co., Buckeye's Town, Md.	do
1573	Pocahontas	Taylor & Bolling Co., Richmond, Va.	Hall & Griggs, Salisbury, N. C.
1574	Royal Exchange	C. B. Osborne, Aberdeen, Md.	W. N. Harris & Co., Salisbury, N. C.
1575	Sunbeam	Austin, Nichols & Co., New York	do
1576	Royal Scarlet	R. C. Williams & Co., New York	A. P. Grizzard, Winston, N. C.
1577	Moore's Delight	J. S. Moore & Sons, Richmond, Va.	J. A. Barrett, Salisbury, N. C.
1578	Star and Crescent	S. J. Seneca, Havre de Grace, Md.	P. A. Cauble, Salisbury, N. C.
1579	Sunbeam	Austin, Nichols & Co., New York City	M. Moses, Salisbury, N. C.
1580	Royal Exchange	C. B. Osborne, Aberdeen, Md.	do
1581	Gilt Edge	Standard Packing Co.	M. Moses, Salisbury, N. C.
1582	Mrs. Mary Cleveland	Mary Cleveland, Conostota, N. Y.	Nash & McGehee, Winston, N. C.
1583	Our Maple Leaf	Durham Canning Co., Durham, Me.	Bridgers & Co., Charlotte, N. C.
1584	Sunny South	Hartford County Packing Co., Aberdeen, Md.	do
1585	Monogram	Portland Packing Co., Portland, Me.	J. M. Sims, Charlotte, N. C.
1586	Mountain Rose	Githens, Rexsamer & Co., Philadelphia, Pa.	J. R. Van Ness & Bro., Charlotte, N. C.
1587	Monmouth	Cuskley-Soule Co., Monmouth, Me.	do
1588	Sunbeam	Austin, Nichols & Co., New York City	S. H. Youngblood, Charlotte, N. C.
1589	Pilgrim	Bennett, Sloan & Co., New York City	W. L. Pope, Charlotte, N. C.
1590	Gilt Edge	Standard Packing Co.	do
1591	Melrose	Githens, Rexsamer & Co., Philadelphia, Pa.	do
1592	Extra Maine	Maine Preserving Co., Portland, Me.	N. Duls, Charlotte, N. C.
1593	Pride of the Valley.	Frederick City Packing Co., Frederick City, Md.	McManus, Short & Co., Charlotte, N. C.
1594	Chariot	Chariot Packing Co., Georgetown, Md.	E. M. Smith, Raleigh, N. C.
1595	Pinnacle	John R. Cary & Co., Richmond, Va.	B. W. Jones, Raleigh, N. C.
1596	White Lily	Githens, Rexsamer & Co., Philadelphia, Pa.	M. Rosenthal, Raleigh, N. C.
1597	Monogram	do	do
1598	Royal Scarlet	R. C. Williams & Co., New York City	B. W. Upchurch, Raleigh, N. C.
1599	Royal Exchange	C. B. Osborne, Aberdeen, Md.	do

FOUND ADULTERATED—CONTINUED.

Date of Purchase.	Laboratory Number.	Packed for.	Actual Weight of Package.	Weight of Contents of Package.	Retail Price of Package.	Cost per Lb. of Material.	Preservative.	Remarks.
		Lbs.	Lbs.	Lbs.	Cts.	Cts.		
Sept. 18, 1902	1561	2.0	1.5	1.3	10	7.7		
----do----------	1562	2.0	1.7	1.4	15	10.7		
----do----------	1563	2.0	1.6	1.3	10	7.7		
----do----------	1564	2.0	1.5	1.3	10	7.7		
----do----------	1565	2.0	1.6	1.3	10	7.7		
----do----------	1566	2.0	1.6	1.4	12.5	8.9		
Sept. 19, 1902	1567	2.0	1.6	1.3	10	7.7		
----do----------	1568	2.0	1.6	1 3	15	11.5		
----do----------	1569	2.0	1.6	1.3	15	11.5		
----do----------	1570	2.0	1.6	1.3	10	7.7		
----do----------	1571	2.0	1.6	1.4	10	7.1		
----do----------	1572	2.0	1.5	1.2	10	8.4		
----do----------	1573	2.0	1.6	1.3	10	7.7		
----do----------	1574	2.0	1.6	1.3	10	7.7		
----do----------	1575	2.0	1.7	1.4	15	10.7		
----do----------	1576	2.0	1.5	1.3	15	11.5		
----do----------	1577	2.0	1.6	1.3	10	7.7		
----do----------	1578	2.0	1.6	1.3	10	7.7		
----do----------	1579	2.0	1.5	1.3	15	11.5		
----do----------	1580	2.0	1.6	1.3	10	7.7		
Sept. 19, 1902	1581	2.0	1.6	1.3	10	7.7		
Sept. 18, 1902	1582	2.0	1.5	1.3	10	7.7		
Sept. 20, 1902	1583	2.0	1.5	1.3	10	7.7		
----do----------	1584	2.0	1.7	1.4	10	7.1		
----do----------	1585	2.0	1.6	1.3	12.5	9.6		
----do----------	1586	2.0	1.6	1.3	15	11.5		
----do----------	1587	2.0	1.6	1.3	10	7.7		
----do----------	1588	2.0	1.6	1.3	12.5	9.6		
----do----------	1589	2.0	1.6	1.3	15	11.5		
----do----------	1590	2.0	1.6	1.3	10	7.7		
----do----------	1591	2.0	1.6	1.3	10	7.7		
----do----------	1592	2.0	1.6	1.3	10	7.7		
----do----------	1593	2.0	1.6	1.3	10	7.7		
Sept. 25, 1902	1594	2.0	1.6	1.3	10	7.7		
----do----------	1595	2.0	1.5	1.3	10	7.7		
----do----------	1596	2.0	1.5	1.3	10	7.7		
----do----------	1597	2.0	1.6	1.3	15	11.5		
----do----------	1598	2.0	1.6	1.3	12.5	9.6		
----do----------	1599	2.0	1.5	1.3	7.5	5.8		

BOTTLED NON-ALCOHOLIC CARBONATED BEVERAGES. SUMMER DRINKS.

By W. M. Allen.

Water charged with carbonic acid gas, flavored and sweetened with a syrup prepared from fruit and sugar, commonly called "soda water," or "soda," is the soft summer drink of the United States. It is sold chiefly by the glass from soda fountains, which are kept in most drug stores and some other places of business.

But it is only the bottled waters with which this report deals. The bottled waters, as well as the waters sold from the soda fountains, are supposed to be prepared from fruit products, and some of them are, but the greater portion are made from artificial "fruit ethers," artificially colored, and some of them preserved with chemical preservatives.

Some of the artificial flavoring substances imitate very closely the fruit products, while others, as the artificial extracts made to imitate strawberry, raspberry and other fruit juices or flavors, belong in other classes and are in many cases quite unlike the flavoring matter of the fruit in chemical composition as well as in flavor. Often a number of these ethers are used together to obtain one flavor, and frequently reveal their artificial nature to the senses of taste and smell.

These beverages differ from each other only in the flavor and coloring matter they contain. As most of the fruit juices have their natural color, the manufacturer of artificial beverages tries to color his artificial product like the fruit it imitates.

Some of the coloring matters, as caramel, are objectionable only because they enable the dealer to sell his product for what it is not. Others, as the coal-tar dyes, are objectionable in themselves, because some of them are known to be injurious to health.

Chemical preservatives, which have been discussed in a former report, have been extensively used in the past, but as their use is not necessary it is to be hoped that their employment will be discontinued.

Bottled soda waters, prepared from syrup containing artificial flavoring and coloring matters, are not acceptable to the better class of trade, and are sold mainly in localities where, on account of the expense, a soda fountain would not be justified.

It is only fair to say that those who build up a good business use, as a rule, good material and sell beverages which are both wholesome and delicious.

RESULTS OF EXAMINATION.

In all, 36 samples were examined. Only 33 were tested for artificial coloring (the quantity of sample in the other three not being sufficient for this purpose), it being found present in 24 of this number. In 17 samples the artificial coloring was caramel, and in seven coal-tar dyes were found.

It is likely that artificial coloring matters are added only to the artificial drinks, as the materials generally employed in these would give colorless beverages, which could not be sold under the names of the various fruit drinks without being colored in imitation of them.

Of the thirty-six samples only three contained a chemical preservative, which was formaldehyde, a very powerful antiseptic.

METHODS OF EXAMINATION.

The methods used were those of the Association of Official Agricultural Chemists.

RESULTS OF EXAMINATION OF BOTTLED

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1659	Ginger Pop	W. A. Tallman, Greensboro, N. C.	Tucker & Erwin, Greensboro, N. C.
1660	Strawberry Soda	do	R. A. McCracken, Greensboro, N. C.
1661	Ginger Ale	do	do
1662	Cream Soda	Robert Portner Brewing Co., Alexandria, Va.	J. R. Silver, Greensboro, N. C.
1663	Strawberry	do	Will Davis, Greensboro, N. C.
1664	Strawberry Soda	Huffine, Greensboro, N. C.	Peter Womble, Greensboro, N. C.
1665	Sarsaparilla Pop	Geo. A. Winkler, Winston, N. C.	F. H. Farabee, Winston, N. C.
1666	Cream Ale	Ludwig & Black, Salisbury, N. C.	D. A. Cauble, Salisbury, N. C.
1667	Ginger Ale	do	do
1668	Wine Punch	N. C. McWhirter, Charlotte, N. C.	C. A. Puckett, Charlotte, N. C.
1669	Chocolate Cream Punch.	do	do
1670	Lemon Punch	do	do
1671	Rocola	Kalola Company, Savannah, Ga.	do
1672	Sarsaparilla Pop	N. C. McWhirter, Charlotte, N. C.	do
1673	Celery Cola	C. Valaer Bottling Works, Charlotte, N. C.	do
1674	Royal Crown Wine Punch.	do	McManus, Short & Co., Charlotte, N. C.
1675	Royal Crown Sarsaparilla.	do	do
1676	Royal Crown Ginger Ale.	do	do
1677	Royal Crown Strawberry Soda.	do	do
1678	Strawberry Pop	Raleigh Steam Bottling Works, Raleigh, N. C.	B. W. Jones, Raleigh, N. C.
1679	Sarsaparilla	do	do
1680	Lemon	do	do
1681	Ginger	do	do
1682	Coca-Cola	Coca-Cola Bottling Co., Atlanta, Ga.	Tucker & Erwin, Greensboro, N. C.
1683	do	do	Weatherly Bros., Greensboro, N. C.
1684	do	do	Fletcher & Rhodes, Greensboro, N. C.
1685	do	do	McManus, Short & Co., Charlotte, N. C.
1686	Vanilla Soda	F. & Y., Charlotte, N. C.	do
1687	Lemon Soda	S. Waters & Son, Elizabeth City, N. C.	Berry & Shannon, Elizabeth City, N. C.
1688	Sarsaparilla Pop	do	do
1689	Ginger Pop	do	do
1690	Vanilla Cream	do	do
1691	Ginger Ale	Cantrell & Cochran, Dublin and Belfast, Ireland.	do
1113	Ginger Ale	C. Valaer Bottling Works, Charlotte, N. C.	Blake & Privatt, Lumberton, N. C.
1114	Beerine	do	do
1115	Lemon Pop	do	do

CARBONATED NON-ALCOHOLIC DRINKS.

Date of Purchase.	Laboratory Number.	Retail Price of Bottle.	Quantity in Bottle.	Preservative.	Coloring Matter.
		Cents.	Pint.		
Sept. 16, 1902	1659	5	½		Caramel.
----do	1660	5	½		Crimson coal-tar dye.
----do	1661	5	½		
----do	1662	5	½		Crimson coal-tar dye.
----do	1663	5	½		Crimson coal-tar dye (very little).
----do	1664	5	½		Crimson coal-tar dye.
Sept. 18, 1902	1665	5	⅔		Caramel.
Sept. 19, 1902	1666	5	½		Crimson coal-tar dye.
----do	1667	5	½		Caramel.
Sept. 20, 1902	1668	5	½		
----do	1669	5	½		Caramel.
----do	1670	5	½		
----do	1671	5	½		Caramel.
----do	1672	5	½		do.
----do	1673	5	⅔		do.
----do	1674	5	⅔		
----do	1675	5	⅔		Caramel.
----do	1676	5	⅔		
----do	1677	5	⅔		Crimson coal-tar dye.
Sept. 25, 1902	1678	5	½		Red coal-tar dye.
Sept. 26, 1902	1679	5	½	Formaldehyde	Caramel.
----do	1680	5	½	----do	
----do	1681	5	½	----do	
Sept. 16, 1902	1682	5	½		Caramel.
----do	1683	5	½		do.
----do	1684	5	½		do.
Sept. 20, 1902	1685	5	½		do.
----do	1686	5	½		do.
Sept. 15, 1902	1687	5	½		
----do	1688	5	½		Caramel.
----do	1689	5	½		do.
----do	1690	5	½		do.
----do	1691	20	⅔		
July 29, 1902	1113	5	½		Test not made.
----do	1114	5	½		do.
----do	1115	5	½		do.

PHOSPHATES, MALTS, CIDERS AND BITTERS.

By W. M. Allen.

These samples, twelve in number, were sent to the Department by individuals and town officials to be tested for alcohol. They were sold as soft or non-alcoholic drinks, tonics or standard medicines.

It will be seen by reference to the table on page 175 that of the twelve samples nine contained as much or more alcohol than beer (3 to 6 per cent), two of them having two-thirds as much as strong whiskey.

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Sent by.
1102	Malt	C. Valaer & Co., Charlotte, N. C.	Bush & Florence, Charlotte, N. C.
1103	Blackberry Bounce		John Short, Charlotte, N. C.
1105	Bodega Bitters		Marion Butler, Raleigh, N. C.
1116	Phosphate	Christian & Fleming, Richmond, Va.	Blake & Privatt, Lumberton, N. C.
1117	do	do	do
1128	Atwood's Famous La grippe Specific	Excelsior Medicine Co., Chicago, Ill.	T. F. Wilkinson, Cary, N. C.
1229	Phosphate	Christian & Fleming, Richmond, Va.	Blake & Privatt, Lumberton, N. C.
1224	Cider	Abraham Hankins, Wilmington, N. C.	Wilmington, N. C.
1234	Cider Rye		Geo. F. Weston, Biltmore, N. C.
1699	Apricot Phosphate	Christian & Fleming, Richmond, Va.	Blake & Privatt, Lumberton, N. C.
1700	Catawba Phosphate.	do	do
1701	Blackberry Phosphate.	do	do

TOMATO CATSUP AND SAUCES.

Tomato catsup is made by pulping and boiling down the tomatoes to the desired consistency and straining to remove seed and skins. The strained pulp is then further cooked with vinegar, spices and other flavoring matters.

Sauces are made in a similar way, but with the addition of more vinegar and pepper. Both sauces and catsups are bottled hot, and closed to kill and exclude germs, but the sterilization and the sealing are not always perfect, and contents of the bottles are kept from spoiling by virtue of the spices and vinegar.

Catsups and sauces are quite popular and very extensively used, being found on the tables of nearly every hotel and restaurant, and are consumed in large quantities in families.

These samples were also examined for chemical preservatives, nine of the twelve samples, or 75 per cent, being found to be thus artificially preserved. For lack of sufficient quantity of material, only five were tested for coloring matter, an artificial coal-tar dye being found in each of the five so examined.

Eight of these beverages, including all of the phosphates and ciders, are artificial products, the flavor being due to "fruit ethers" and the color to added dye stuffs.

METHODS OF EXAMINATION.

The provisional methods of the Association of Official Agricultural Chemists were used in this work.

PHOSPHATES, CIDERS, MALTS, AND BITTERS.

Date of Purchase.	Laboratory Number.	Retail Price.	Total Solids.	Alcohol.	Preservatives.	Coloring Matter.
		Cts. Qt.	Per Ct.	Per Ct.		
Jan. 20, 1900	1102	----------	4.85	4.65	Salicylic acid ----------	Test not made.
----do ----------	1103	----------	19.94	8.20	Salicylic acid, formaldehyde.	do.
July 3, 1900	1105	----------	0.19	32.60	----------	do.
July 29, 1900	1116	50	31.05	----------	Salicylic acid, formaldehyde.	Coal-tar dye.
----do ----------	1117	50	23.83	----------	----do ----------	Test not made.
Sept. 20, 1900	1128	70	1.73	34.50	Test not made----------	do.
----------	1229	50	21.03	1.60	Salicylic acid, formaldehyde.	Coal-tar dye.
----------	1224	----------	20.89	15.30	Formaldehyde, small amount.	Test not made.
----------	1234	----------	----------	7.85	Test not made----------	do.
----------	1699	50	13.40	7.10	Salicylic acid, good deal.	Orange coal-tar dye.
----------	1700	50	13.97	6.15	----do ----------	Coal-tar dye.
----------	1701	50	13.33	7.90	Salicylic acid, formaldehyde.	Black coal-tar dye.

Some of the commercial catsups and sauces are made of good materials, but others are said to be made from the refuse of tomato canneries or other inferior materials, and most of them are colored with dyes and preserved with chemical preservatives. In coloring, magenta, eosin, ponceau, tropeolin and other dyes of coal-tar and other origin are used. They give the catsups a brilliant red color, and those who are unaware that the genuine uncolored goods have a dull red color believe it is the natural color of the fruit. The objections to the use of artificial coloring are many. They deceive the purchaser; some of them are injurious to health; they may serve to hide dirt and disguise inferior and unwholesome materials. They put the uncolored product at a disadvantage and in no way improve the quality of the product. The chemical preservatives commonly employed are formaldehyde, salicylic acid and benzoic acid, the latter acid being most frequently and largely used. The subject of preservatives in food products has already been discussed. Some of the catsups and sauces contained very large amounts of these materials.

Sixteen samples of tomato catsups and six samples of sauces were examined. All of them contained coal-tar dyes. Fourteen, or 63.2 per cent, contained chemical preservatives as follows: Ten benzoic acid, four formaldehyde, one salicylic acid, and one formaldehyde and benzoic acid. These preservatives were in extremely large quantities, especially the benzoic acid. The results of the examination are given in the table.

TOMATO CATSUPS

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1601	Beef Steak	Joseph Campbell Preserving Co., Camden, N. J.	Rankin Bros. Grocery Company, Greensboro, N. C.
1602	Royal Tomato	The Horton Cato Mfg. Co., Detroit, Mich.	do
1603	Heinz	H. J. Heinz Co., Pittsburg, Pa.	do
1604	Sunny South	Reliable Pickling Co., West Point, Va.	J. R. Foster & Co., Greensboro, N. C.
1605	Rival	Price & Lucas Cider and Vinegar Co., Louisville, Ky.	do
1606	Van Camps	Van Camps Packing Co., Indianapolis, Ind.	A. P. Grizzard, Winston, N. C.
1607	Royal Scarlet	R. C. Williams & Co., New York City	do
1608		Hirsch Bros. & Co., Louisville, Ky.	do
1609	Hoffman House	J. Weller & Co., Cincinnati, O.	S. O. Bennett, Winston, N. C.
1610	Sunset	Van Lill Preserving Co., Baltimore, Md.	do
1611	Hoffman House	J. Weller Co., Cincinnati, O.	Griffith & Lentz, Winston, N. C.
1612	Blue Label	Curtice Bros. & Co., Rochester, N. Y.	do
1613	Heinz	H. J. Heinz Co., Pittsburg, Pa.	do
1614	American	Hymon Pickling Co., Louisville, Ky.	Miller & Campbell, Charlotte, N. C.
1615	Household	R. B. Stewart & Co., Baltimore, Md.	Old & Fearing, Elizabeth City, N. C.
1616	Lion	Hudson Preserving Co., New York City	do

SAUCES FOUND

1617	Challenge	E. R. Durkee & Co., New York City	Rankin Bros. Grocery Company, Greensboro, N. C.
1618	Worcestershire	Githens, Rexsamer & Co., Philadelphia, Pa.	do
1619	Terrapin	Fonerden Specialty Co., Baltimore, Md.	do
1620	Worcestershire	Lea & Perrins, New York City	do
1621	Campbell's Chili	Joseph Campbell Preserving Co., Camden, N. J.	do
1622	Stag's Head	Crary & Co., New York City	Old & Fearing, Elizabeth City, N. C.

METHODS OF ANALYSIS.

Total Solids.—Evaporate two grams of the material to dryness in a platinum dish on a water bath and dry at temperature of boiling water until the weight is constant, or nearly so.

Acidity.—Dilute ten grams of the water and titrate with standard alkali, using phenolphthalein as indicator. Calculate to acetic acid.

Detection of Dyes and Preservatives.—The provisional methods of the Association of Official Agricultural Chemists were used.

FOUND ADULTERATED.

Date of Purchase.	Laboratory Number.	Retail Price of Bottle.	Quantity in Bottle, Fluid Ounces.	Price Per Fluid Ounce.	Total Solids.	Acidity as Acetic Acid.	Preservatives.	Coloring Matter.
		Cts.		Cts.	Per Ct.	Per Ct.		
Sept. 16, 1902	1601	25	18.0	1.4	21.71	1.36	Benzoic acid, formaldehyde.	Eosine.*
----do----------	1602	25	15.0	1.7	19.59	1.22	Benzoic acid----	do.*
----do----------	1603	25	12.0	2.0	19.35	0.87	----do----------	do.*
----do----------	1604	10	19.0	0.5	7.0	1.70	----------	Ponceau.*
----do----------	1605	15	14.0	1.0	31.95	0.93	Salicylic acid---	Eosine.*
Sept. 18, 1902	1606	15	8.0	1.9	14.74	0.93	Benzoic acid----	do.*
----do----------	1607	25	17.0	1.5	15.35	1.21	----do----------	do.*
----do----------	1608	25	14.0	1.8	10.48	0.87	----------	Ponceau.*
----do----------	1609	15	14.0	1.0	13.86	0.97	Benzoic acid----	Eosine.*
----do----------	1610	15	10.0	1.5	17.03	0.93	----------	Ponceau.*
----do----------	1611	15	14.0	1.0	10.60	0.97	Benzoic acid----	Eosine.*
----do----------	1612	25	15.0	1.7	13.92	1.21	Test not made--	do.*
----do----------	1613	35	17.0	2.0	16.14	0.97	Benzoic acid----	do.*
Sept. 20, 1902	1614	10	9.0	1.1	12.20	1.22	----------	do.*
Sept. 15, 1902	1615	10	15.0	6.7	9.73	1.21	Formaldehyde--	do.*
----do----------	1616	15	15.0	1.0	7.52	1.08	Benzoic acid----	Ponceau.*

ADULTERATED.

Sept. 16, 1902	1617	25	6.0	4.1	27.60	2.91	Formaldehyde--	Tropeolin.*
----do----------	1618	25	6.0	4.1	24.08	3.16	----do----------	do.*
----do----------	1619	15	6.0	2.5	16.17	2.91	----------	do.*
----do----------	1620	30	6.0	5.0	27.10	2.91	----------	do.*
----do----------	1621	10	10.0	1.0	23.34	0.97	Benzoic acid----	Eosine.*
Sept. 15, 1902	1622	10	6.0	1.7	16.78	2.91	----------	Tropeolin.*

*Coal-tar dye.

PREPARED MUSTARDS AND SALAD DRESSINGS.

By W. M. Allen.

Prepared mustard is a mixture of ground mustard seed and vinegar, flavored and seasoned with pure spices and herbs and salt. Salad dressing also contains olive oil. The formula given on the label of No. 519, a prepared mustard, is:

Pure mustard seed	20.00 per cent.
Pure vinegar	76.00 per cent.
Pure spices and herbs	1.50 per cent.
Salt	2.50 per cent.

PREPARED MUSTARDS AND SALAD

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
492	Knadler	Knadler Pickling Co., Louisville, Ky.	Barnes, Overman & Co., Wilson, N. C.
493	Royal	The Horton Cato Manufacturing Co., Detroit, Mich.	----do----
519	Finest Quality	R. C. Williams & Co., New York, N. Y.	A. E. Cummings, Kinston, N. C.
522	Hyman's	The Hyman Pickle Co., Louisville, Ky.	Barnes, Overman & Co., Wilson, N. C.
523	Heinz	H. J. Heinz Co., Pittsburg, Pa.	----do----
524	Superior Quality	W. J. Hunter, Wheeling, W. Va.	J. L. Starkey & Bro., Greenville, N. C.
529	Moutarde	W. Charles Culden	M. Rosenthal, Raleigh, N. C.
532	Heinz	H. J. Heinz Co., Pittsburg, Pa.	Julius Heller, Raleigh, N. C.
1471	Campbell's	Joseph Campbell Preserving Co., Camden, N. J.	Rankin Bros. Grocery Company, Greensboro, N. C.
534	Horse-radish	J. Weller Co., Cincinnati, O.	I. B. Fonville, Goldsboro, N. C.

PREPARED MUSTARD NOT

525	Kalamazoo	The Dunkley Celery Co., Kalamazoo, Mich.	J. L. Starkey & Bro., Greenville, N. C.

The examination shows that it, as well as six others, out of eleven samples, or 64 per cent, contained starch, though the latter is not mentioned in the formulas on any of them. Ripe or dry mustard seed do not contain starch; the green seed contain a very small amount, but by no means so much as was found in these samples. Starch does not add to the quality of these products, but decreases their strength and increases their bulk and weight, and should, to this extent, be considered an adulteration.

Sixty-four per cent of these samples also contained formaldehyde, a chemical preservative. Ninety per cent of them, or all but one, No. 525, are adulterated with either starch or formaldehyde, and four of them, or 44 per cent, contained both. With sufficient vinegar and spices there is no need for preservatives in this class of materials.

METHODS OF EXAMINATION.

The provisional methods of the Association of Official Agricultural Chemists were employed.

DRESSINGS FOUND ADULTERATED.

Date of Purchase.	Laboratory Number.	Retail Price of Bottle.	Quantity in Bottle, Fluid Ounces.	Retail Price per Fluid Ounce.	Adulterants.	
					Preservatives.	Filler.
		Cts.		Cts.		
July 12, 1900	492	20	8.0	2.5	----------	Starch.
----do ----------	493	50	16.0	3.1	Formaldehyde (trace) --	do.
July 19, 1900	519	15	16.0	0.9	----do ----------	do.
July 12, 1900	522	15	8.6	1.7	----do ---------- (trace) --	do.
----do ----------	523	15	8.2	1.8	----do ----------	
July 20, 1900	524	15	15.0	1.0	----do ----------	Starch.
August 4, 1900	529	15	8.0	1.9	----do ----------	
----do ----------	532	10	----------	----------	----do ----------	
Sept. 16, 1902	1471	15	10.0	1.5	----------	Starch.
July 16, 1900	534	25	10.0	2.5	----------	do.

FOUND ADULTERATED.

		Cts.		Cts.		
July 20, 1900	525	15	11.0	1.4	----------	

CHEESE.

By J. M. Pickel.

Cheese may be defined as "the solid food product formed by coagulating the casein of milk by means of rennet or acids, containing as its chief constituents milk fat, cheese proteids, water and ash, with or without salt, sage or harmless coloring matter." By *ash* in this connection is, of course, meant mineral constituents, normally in milk, which, on evaporating the milk to dryness and burning, are left as the incombustible residue.

Whilst the great mass of cheese is made from cow's milk, a limited quantity is made from the milk of other animals, notably goats and sheep. The celebrated Roquefort cheese of France is made, in part, at least, from ewes' milk.

The average composition of American cheese is about as follows:*

Water	31.50 per cent.
Fat	37.00 per cent.
Proteids	26.25 per cent.
Ash, sugar, etc	5.25 per cent.

The sugar here referred to is milk sugar, only a small portion of which, in the process of manufacture, gets into the cheese, the larger part remaining in solution in the whey.

From the analysis it will be seen that cheese is an exceedingly concentrated food—one of the most concentrated, in fact, of all foods—and, therefore, needs to be partaken of in moderation and along with relatively large proportions of bread or other starchy foods.

ADULTERANTS.

Cheese is adulterated in two ways, mainly, (1) by partly removing the cream from the milk—this gives skim-milk cheese, which, while a strong, valuable food, still contains a relatively low percentage of fat; (2) by removing the cream entirely and substituting therefor other and cheaper fats, producing what is known as filled cheese. Filled cheese, when properly made, of good materials, is a valuable, wholesome food, but should be sold under its own name and at a cheaper price.

RESULTS.

Of the thirty-three samples of cheese examined and reported on here, four—Nos. 1327, 1328, 1706 and 1710—are low in percentage of fat, and are to be classed as skim-milk cheese. Two of these—Nos. 1706 and 1710—were sold at a correspondingly low price—15 cents per pound. They were put up by the same manufacturer, and are of the same brand—*Blue Ribbon*. One of them—No. 1710—claimed as a sub-title on the label to be *"Selected Full Cream Cheese"*; possibly the other made the same claim, but the collector of the sample did not make a note of the fact. Another sample—No. 1336—of this same brand, Blue Ribbon, shows nothing like so considerable a deficiency in

*Van Slyke, quoted by Leffmann and Beam in "Food Analysis," page 247.

fat. It was sold at the same price (15 cents) as the others. No. 1709, branded "*Highest Grade Cream Cheese*," is also to be classed as a skim-milk cheese, although containing much more fat than Nos. 1706 and 1710; it retailed at 15 cents. Nos. 1327 and 1328, which bear no special brand, are likewise skim-milk cheese, but they were retailed at the highest price paid for the best grades, namely, 20 cents a pound.

To sum up—

Samples containing average fat or more	17 or 36.3 per cent.
Samples containing less than average:	
Samples containing 0.7 to 5 per cent less	10 or 30.3 per cent.
Samples containing 6.3 to 10 per cent less	5 or 15.2 per cent.
Samples containing 12.1 to 12.2 per cent less	2 or 6.1 per cent.
Samples containing 18.2 to 23.9 per cent less (skim milk),	4 or 12.1 per cent.

METHODS OF ANALYSIS.

The methods of the Association of Official Agricultural Chemists were followed, except that in some cases the fat for determining the Reichert-Meissl number was extracted by placing the cheese, which had been passed through a meat-chopper, on a cheese cloth stretched over a beaker, and heating in a water-oven. The fat filters through clear and dry, but skim-milk cheese can not be thus treated—does not part with enough fat.

Also the same samples weighed out for the determination of moisture were ground up with sand and anhydrous copper sulphate and used for fat determination.

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1315	Tarbell	W. P. Harvey & Co., Baltimore, Md.	Hiatt & Lamb, Greensboro, N. C.
1316	Young America	Rockingham Cheese Co., Linville, Va.	Fletcher & Rhodes, Greensboro, N. C.
1317			S. E. Hudson, Greensboro, N. C.
1318	Tarbell	W. P. Harvey & Co., Baltimore, Md.	J. R. Foster & Co., Greensboro, N. C.
1319	N. Y. State Colored Cream.	Merchants Grocery Co., Greensboro, N. C.	W. W. Hogshead, Greensboro, N. C.
1320	Tarbell	W. P. Harvey & Co., Baltimore, Md.	Shaw Bros. & Co., Greensboro, N. C.
1321	Banquet	Taylor & Bolling Co., Richmond, Va.	A. P. Grizzard, Winston, N. C.
1322	Jersey		S. O. Bennett, Winston, N. C.
1323	Blue Label		Griffith & Lentz, Winston, N. C.
1325	Maple Grove	Howard & Brewer, Richmond, Va.	W. M. Harris & Co., Salisbury, N. C.
1326	Leggett's Premier	F. H. Leggett & Co., New York	Klutz & Randleman, Salisbury, N. C.
1327		Davis Grocery Co., Lynchburg, Va.	P. A. Cauble, Salisbury, N. C.
1328		do	D. L. Cauble, Salisbury, N. C.
1329	Best Cheese	Austin, Nichols & Co., New York	W. H. Wallace, Salisbury, N. C.
1330	Glouster	Crego & Son, New York	Bridgers & Co., Charlotte, N. C.
1331	Cream	Austin, Nichols & Co., New York	S. H. Youngblood, Charlotte, N. C.
1333	Tarbell	W. P. Harvey & Co., Baltimore, Md.	N. Duls, Charlotte, N. C.
1334		John S. Martin & Co.	McManus, Sharp & Co., Charlotte, N. C.
1335	Extra Cream	do	Miller & Campbell, Charlotte, N. C.
1336	Blue Ribbon	G. S. Hart & Co., New York	E. M. Smith, Raleigh, N. C.
1337	Schweitzer		M. Rosenthal & Co., Raleigh, N. C.
1338	Tarbell	W. P. Harvey & Co., Baltimore, Md.	do
1339	Clover		do
1340			W. R Dorsett, Raleigh, N. C.
1341	Magnolia	G. S. Hart & Co., New York	Old & Fearing, Elizabeth City, N. C.
1428	Premier	F. H. Leggett & Co., New York	Woollcott Grocery, Raleigh, N. C.
1429	Extra Cream	John S. Martin & Co., New York	N. L. Pope, Charlotte, N. C.
1705	Jersey	Stacy Cheese Co., Little Fall, N. Y.	B. W. Upchurch, Raleigh, N. C.
1706	Blue Ribbon	G. S. Hart & Co., New York	S. C. Leeson, Raleigh, N. C.
1707	N. Y. State Cream	Austin, Nichols & Co., New York	J. R. Ferrall & Co., Raleigh, N. C.
1708	Extra Cream Cheese.	Jno. S. Martin & Co., New York	W. J. Reavis, West Raleigh, N. C.
1709	Highest Grade Cream Cheese.	G. S. Hart & Co., New York	E. M. Smith, Raleigh, N. C.
1710	Blue Ribbon (Selected full Cream)	do	Oscar Powell, Raleigh, N. C.

NATION OF CHEESE.

Date of Purchase.	Laboratory Number.	Retail Price per Lb.	Moisture, Per Cent.	Proteids, Per Cent.	Fat, Per Cent.	Butyro-refractometer.		Reichert-Meissl No.	Remarks.
						Temperature.	Critical Line.		
		Cts.				°			
Sept. 16, 1902	1315	18	21.87	28.50	38.15	27.7	51.0	------	Above the average in fat.
----do ----------	1316	18	18.52	29.38	41.07	27.7	51.2	26.1	do.
----do ----------	1317	20	22.04	29.44	37.87	27.5	51.5	28.3	do.
----do ----------	1318	20	18.35	36.00	37.17	29.0	48.2	24.6	do.
Sept. 17, 1902	1319	16⅔	26.25	37.43	28.10	27.5	51.5	28.6	Much below the average in fat.
----do ----------	1320	20	23.43	32.56	38.18	27.7	50.5	26.	Above the average in fat.
Sept. 18, 1902	1321	18	25.25	32.81	35.10	31.0	50.0	------	Below the average in fat.
----do ----------	1322	20	27.87	29.13	35.33	27.0	50.0	------	do.
----do ----------	1323	20	30.25	37.00	26.89	31.0	49.7	------	Much below the average in fat.
----do ----------	1325	20	26.04	37.37	30.72	28.0	51.0	------	Considerably below the average in fat.
----do ----------	1326	20	30.21	24.00	34.77	31.0	50.0	------	Below the average in fat.
----do ----------	1327	20	31.92	34.6	18.78	27.7	52.0	29.9	Skim-milk cheese.
----do ----------	1328	20	28.30	37.29	17.97	25.0	53.5	25.8	do.
----do ----------	1329	20	19.20	30.94	37.30	30.3	49.2	------	Above the average in fat.
Sept. 20, 1902	1330	16	29.02	37.00	24.87	30.3	49.4	------	Very much below the average in fat.
----do ----------	1331	20	21.80	32.25	38.67	28.6	49.4	------	Above the average in fat.
----do ----------	1333	20	23.53	28.44	38.77	28.6	50.2	------	do.
----do ----------	1334	20	29.25	27.25	31.96	28.6	49.5	------	Much below the average in fat.
----do ----------	1335	20	20.54	33.56	3.65	28.6	50.0	------	Below the average in fat.
Sept. 25, 1902	1336	15	26.66	32.87	28.72	29.4	51.0	------	Much below the average in fat.
----do ----------	1337	35	24.38	32.12	34.10	29.4	48.2	------	Below the average in fat.
----do ----------	1338	17½	22.90	27.25	39.67	28.6	52.0	29.0	Above the average in fat.
----do ----------	1339	25	40.45	16.90	36.12	29.4	50.2	------	Below the average in fat.
----do ----------	1340	15	29.51	26.88	34.83	29.4	48.8	------	do.
Sept. 15, 1902	1341	15	18.87	30.00	40.62	27.7	51.2	------	Above the average in fat.
Oct. 6, 1902	1428	17½	29.80	25.56	36.77	30.3	49.2	------	Average in fat.
Sept. 20, 1902	1429	20	28.40	31.94	32.05	29.4	49.4	------	Below the average in fat.
Nov. 28, 1902	1705	15	28.06	27.12	36.30	27.7	51.7	25.7	do.
----do ----------	1706	15	43.57	34.31	14.12	27.7	52.2	24.7	Skim-milk cheese.
----do ----------	1707	20	33.40	24.87	34.88	27.7	51.2	27.8	Below the average in fat.
----do ----------	1708	18	29.71	24.56	38.60	27.7	51.5	26.6	Above the average in fat.
----do ----------	1709	15	38.12	30.06	23.45	27.7	51.3	26.7	Skim-milk cheese, probably.
----do ----------	1710	15	46.20	32.00	14.90	27.7	52.0	26.0	Skim-milk cheese.

BUTTER, RENOVATED BUTTER AND BUTTERINE.

By J. M. Pickel.

Twenty samples of butter and two of butterine, or oleomargarine, were examined. No adulteration was found. The butterine was sold as such. Among the samples of butter was one of "*process butter*," that is, butter which, having become rancid and unmarketable for table use direct, had been put through a process of renovation. This sample was sold under its proper name—*process butter*. There is no sure or satisfactory method of distinguishing process or renovated butter from butter which has not been renovated. The thrifty house-wife has from time immemorial practiced the art of "freshening up" stale, rancid butter. This she does by working it over and washing it with clean, cold water, to which, perhaps, a pinch of soda, borax or saltpetre has been added; and, no doubt, the quantity of "freshened up" butter which gets into the market, or goes direct from the farmer to the consumer in driblets, is, and has always been, considerable in the aggregate. This is, however, not what is known in trade as

PROCESS BUTTER.

Within the last ten or fifteen years there have been established in various parts of the country finely equipped plants for renovating butter. The process through which it is put is briefly as follows:

The butter is melted and clarified or refined; the clarifying is accomplished by "skimming, settling, aerating, washing, and other processes, through the action of heat, cold, agitation or motion, or rest." Thus treated, the product becomes an almost tasteless and odorless fat. To restore to it "a similar appearance, consistency, texture and flavor" to that of fresh butter, it is subjected to some such further process as this: It is granulated by cooling or chilling, and "churned or otherwise mixed with milk or skim-milk, buttermilk, or cream, sweet or sour." Common salt or artificial coloring (such as is universally practiced by dairymen) may be added; but if in this process "or in any (other) way, any acid, alkali, chemical, or any substance foreign to butter (including any fat or oil other than butter fat), or if in any way the substance is made to hold 'abnormal quantities of water, milk or cream,' the substance or commodity is to be recognized and treated as 'adulterated butter,'" under Act of the Congress of the United States, approved May 9, 1902.

BUTTERINE, IMITATION BUTTER, OR OLEOMARGARINE.

The two samples of butterine reported on in this paper contained large quantities of cotton-seed oil product; and this is now generally, if not universally true in this country. Oleomargarine was invented thirty-two or thirty-three years ago by the French chemist, Mège Mouriès, on the wish, it is said, of Napoleon III, for a cheap butter substitute for the use of the poor, and of good keeping qualities, and, therefore, suitable for armies and navies on campaigns. The original French method of manufacture, modified only as to

details, is still in vogue. Beef fat is rendered at moderate temperature (about 150 degrees F.). After cooling in vats it is subjected at the requisite temperature to pressure, by which means the more fusible part of the fat is separated out as a semi-liquid oil. The object of both these operations (the rendering and the pressing) is to win a product which has been freed of a part of the stiff, hard stearine of the original tallow, and which has the consistency of butter. After such further manipulation as may be given this product to improve its granulation and texture, a more or less butter-like flavor and odor is imparted to it by churning it with milk, skim milk, cream or buttermilk, or, possibly, by mixing in a bit of genuine butter. Neutral lard and cotton-seed oil product, especially the latter, now that its refinement has in recent years been brought to such high state of perfection, are at the present day, along with beef fat, the constituents of oleomargarine.

In nutritive value, oleomargarine and compound lard are not materially, if at all, inferior to genuine butter and lard. The comparative digestibility of butter, oleomargarine, lard, tallow and oils has been found, by various experiments, to be about the same. The following figures, representing the percentage of each that is digestible, are instructive:

Butter, Per Cent.	Oleomargarine, Per Cent.	Lard, Tallow, Oils, Per Cent.
96.00[1]	95.00[1]	95.00[1]
95.96[2]	96.70[2]	
96.86[2]	96.93[2]	
97.13[2]	96.75[2]	
95.49[3]	94.34[3]	
Average---96.27	95.94	

The heat-producing value of some fats is as follows:

Butter fat ..... 9192 units (or calories).
Fat of oxen..... 9357 units (or calories).
Fat of swine..... 9380 units (or calories).
Fat of sheep..... 9406 units (or calories).

METHODS OF ANALYSIS.

The official methods of the Association of Agricultural Chemists were followed.

[1] Atwater's compilation. [2] Luehrig, a German experimenter. [3] Scandinavian experiments quoted by Luehrig. Chem. Cent. Blatt, 1899, Bd. II, 215.

RESULTS OF THE EXAMINATION

Laboratory Number	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1342	Clover Hill	Fox River Butter Co., Aurora, Ill.	Rankin Bros. Grocery Co., Greensboro, N. C.
1343	Meadow Gold	Continental Creamery Co., Topeka, Kan.	do
1344	Country	W. M. Shaw, Lamont, N. C.	C. E. Pugh, Greensboro, N. C.
1345	do		T. M. Pickard & Co., Greensboro, N. C.
1346	do	Mt. Airy, N. C.	do
1347	Sunny Brook	Armour Packing Co., Pittsburg, Pa.	J. H. Boone, Greensboro, N. C.
1348		Pittsburg Creamery Co., Pittsburg, Pa.	O. F. Pearce, Greensboro, N. C.
1349	Primrose	Continental Creamery Co., Topeka, Kan.	Shaw Bros. & Co., Greensboro, N. C.
1350	do	do	Hiatt & Lamb, Greensboro, N. C.
1351	Country		S. O. Bennett, Winston, N. C.
1352	do		W. M. Harris & Co., Salisbury, N. C.
1353	do		S. H. Youngblood, Charlotte, N. C.
1354	Premier	F. H. Leggett & Co., New York	J. M. Sims, Charlotte, N. C.
1355			Van Ness & Bro., Charlotte, N. C.
1356	Country		McManus, Sharp & Co., Charlotte, N. C.
1357	Butterine	Armour Packing Co., Kansas City	Powell & Co., Charlotte, N. C.
1358	Clover Hill	Fox River Butter Co., Aurora, Ill.	M. Rosenthal & Co., Raleigh, N. C.
1359	Butterine	Swift & Co., Chicago, Ill.	B. W. Upchurch, Raleigh, N. C.
1695	Country		Miller & Campbell, Charlotte, N. C.
1696	Renovated	Illinois Creamery Co., Chicago, Ill.	B. W. Upchurch, Raleigh, N. C.
1697	Clover Hill	Fox River Butter Co., Aurora, Ill.	Old & Fearing, Elizabeth City, N. C.
1698	do	do	Fulmer & Whitehurst, Elizabeth City, N. C.

OF BUTTER AND BUTTERINE.

Date of Purchase.	Laboratory Number.	Retail Price per Lb.	Butyro-refractometer.		Reichert-Meissl No.	The Results Show the Samples to be—
			Temperature.	Critical Line.		
		Cts.	°			
Sept. 16	1342	28	27.7	51.5	28.2	Butter.
----do	1343	28	27.7	50.2		do.
Sept. 17	1344	25	27.7	49.1		do.
----do	1345	25	27.7	49.0		do.
----do	1346	20	27.7	49.0		do.
----do	1347	28	27.7	51.0		do.
----do	1348	28	27.7	51.3	29.6	do.
----do	1349	30	27.7	49.0		do.
----do	1350	30	27.7	50.0		do.
Sept. 18	1351	25	27.7	47.0		do.
Sept. 19	1352	25	27.7	50.0		do.
Sept. 20	1353	25	27.7	50.0		do.
----do	1354	30	27.7	51.8	27.2	do.
----do	1355	30	27.7	50.0	29.4	do.
----do	1356	20	27.7	50.2		do.
----do	1357	20	28.0	57.2	2.8	Butterine.
Sept. 25	1358	30	28.0	51.2		Butter.
----do	1359	15	28.0	58.3	5.5	Butterine.
Sept. 20	1695	25	29.0	47.8		Butter.
Sept. 25	1696	25	29.0	49.0		Renovated Butter.
Sept. 15	1697	28	28.0	51.3		Butter.
----do	1698	28	29.3	51.2		do.

LARD AND COMPOUND LARD.

By J. M. Pickel.

Thirty-two samples of lard, bought in thirty different groceries, located in eight widely separated towns, were examined. Only one sample (No. 1266) was found to be adulterated; it contained a small amount of cotton-seed oil—so small that its presence in the lard could possibly be due to the hogs having been fed on cotton-seed meal, in which case it could not be classed as adulterated.

All other samples examined, twenty-four in number, were sold as *compound lard*, under various trade names—Palmatina, Snow Drift, White Cloud, Jewel, Flake White, Cottolene. These preparations all contain large quantities of cotton-seed oil. Although not possessing the snowy whiteness of most of the lards, they were usually quite fair and of cleanly, excellent appearance. There is no reason known to the writer to suppose them less wholesome or valuable as articles of food than lard. The most common price (retail) paid for the compound lards was 11 and 12½ cents, occasionally 10 cents, and in one case 15 cents, a pound. The usual price of lard was 14 cents, occasionally 14½ and 15 cents, and frequently 12½ cents a pound.

Lard is the rendered fat of swine. The admixture with this of any foreign fat or oil is adulteration, unless the product is sold for what it is—a mixture or compound.

Lard will vary more or less in character with the mode of rendering, the part of the pig from which it is taken, the kind of feed, etc. The United States Department of Agriculture (Division of Chemistry, Bulletin 13, 1889) gives the following classification of lard:

NEUTRAL LARD.

This is "composed of the fats derived from the leaf of the slaughtered animal." It is rendered in open kettle at such a temperature as to extract only a part of the fat. The extracted fat is washed with water containing a trace of soda, salt or acid. The lard thus obtained is almost *neutral*, contains not over one-fourth of a per cent of free acid, and is used largely in the manufacture of oleomargarine.

LEAF LARD.

The unextracted residue left in the above process is subjected to steam heat under pressure. The product thus obtained is *leaf lard*. This, as will be noted, is the more solid, or the less fusible, portion of the fats contained in the leaf.

CHOICE KETTLE-RENDERED LARD—CHOICE LARD.

This is made from the leaf, together with trimmings from the backs, and is rendered in steam-jacketed open kettles. The Chicago Board of Trade definition of choice lard is, that it is "to be made from leaf and trimmings only, either steam or kettle-rendered, the manner of rendering to be branded on each tierce."

PRIME STEAM LARD.

The parts rendered in the preparation of this grade are: The whole head of the hog, except the jowl; the fat from the small intestines; any fat that may be attached to the heart; in houses where open kettle lard is not made, the back fat and trimmings; and, at times, when there is no demand for leaf lard, the leaf. The rendering is effected in tanks by the direct application of steam.

BUTCHER'S LARD.

This is lard rendered by butchers in kettles after the manner of farmers, for home consumption. This lard is frequently dark colored, and contains a considerable quantity of glue.

GUTS.

This includes, in hog-packers' parlance, everything inside the hog, except the heart and lungs. After three or four washings, everything of this nature goes into the rendering tank, except the intestines proper, which are saved for sausage casings, the liver, lungs and that part of the heart free of fat. The grease obtained thus does not, it is claimed by the manufacturers, go into the lard of commerce, but is used in the manufacture of lard oil and soap.

METHODS OF ANALYSIS.

The official methods of the Association of Agricultural Chemists were followed.

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1278	White Label	Armour Packing Co., Kansas City, Mo.	J. R. Foster & Co., Greensboro, N. C.
1280	do	do	Fletcher & Rhodes, Greensboro, N. C.
1281	do	J. P. Squires & Co., Boston, Mass.	Hiatt & Lamb, Greensboro, N. C.
1282	Silver Leaf	Swift & Co., Chicago, Ill.	A. P. Grizzard, Winston, N. C.
1286	White Label	Armour Packing Co., Kansas City, Mo.	S. O. Bennett, Winston, N. C.
1287	Indiana	Kingan & Co., Indianapolis, Ind.	Griffith & Lentz, Winston, N. C.
1289	do	do	Nash & McGehee, Winston, N. C.
1290	do	do	D. M. Miller, Salisbury, N. C.
1291	Silver Leaf	Swift & Co., Chicago, Ill.	Theo. Atwell, Salisbury, N. C.
1294	Pure	Burkhardt Packing Co., Dayton, O.	Hall & Griggs, Salisbury, N. C.
1295	Shield	Armour & Co., Omaha, Neb.	do
1297	Silver Leaf	Swift & Co., Chicago, Ill.	N. W. Harris & Co., Salisbury, N. C
1302		W. S. Forbes, Richmond, Va.	Bridgers & Co., Charlotte, N. C.
1303	Simon Pure	Armour & Co., Kansas City, Mo.	J. M. Sims, Charlotte, N. C.
1304	Indiana	Kingan & Co., Indianapolis, Ind.	J. R. Van Ness, Charlotte, N. C.
1305		Lipton, Chicago, Ill.	W. L. Pope, Charlotte, N. C.
1306		Cochran, McLauchlin & Co., Charlotte	N. Duls, Charlotte, N. C.
1308		Lipton, Chicago, Ill.	Miller & Campbell, Charlotte, N. C.
1310	Shield	Armour & Co., Chicago, Ill.	B. W. Upchurch, Raleigh, N. C.
1312	Pure	do	Old & Fearing, Elizabeth City, N. C.
1287	Indiana	Kingan & Co., Indianapolis, Ind.	Griffith & Lentz, Winston, N. C.
1289	do	do	Nash & McGehee, Winston, N. C.
1290	do	do	D. M. Miller, Salisbury, N. C.
1291	Silver Leaf	Swift & Co., Chicago, Ill.	Theo. Atwell, Salisbury, N. C.
1294	Pure	Burkhardt Packing Co., Dayton, O.	Hall & Griggs, Salisbury, N. C.
1263	Silver Leaf	Swift & Co., Chicago, Ill.	C. E. Pugh, Greensboro, N. C.
1266	Leaf	Miller & Miller, Baltimore, Md.	G. W. Denny, Greensboro, N. C.
1268	White Label	Armour Packing Co., Kansas City, Mo.	T. M. Pickard & Co., Greensboro, N. C.
1271	Silver Leaf	Swift & Co., Chicago, Ill.	W. B. Young, Greensboro, N. C.
1272	White Label	Armour Packing Co., Chicago	J. H. Boone, Greensboro, N. C.
1275	Pure Leaf	J. P. Squires, Boston, Mass.	Rankin Bros. Grocery Company, Greensboro, N. C.
1276	White Label	Armour Packing Co., Kansas City, Mo.	do

NATION OF LARD.

Date of Purchase.	Laboratory Number.	Retail Price per Lb.	Butyro-refractometer.		Halphen's Test for Cotton-seed Oil.	Remarks.
			Temperature.	Scale Division.		
		Cts.	°			
Sept. 17	1278	14	39.5	50.6	No red coloration	Contains no cotton-seed oil.
----do	1280	12½	39.5	51.8	----do	do.
----do	1281	14	39.5	52.5	----do	do.
Sept. 18	1282	14	39.5	51.2	----do	do.
----do	1286	12½	39.6	51.0	----do	do.
----do	1287	14	39.6	51.5	----do	do.
----do	1289	14½	39.6	50.8	----do	do.
Sept. 19	1290	14	39.7	51.0	----do	do.
----do	1291	15	39.5	51.2	----do	do.
----do	1294	14	39.5	50.8	----do	do.
----do	1295	13½	39.5	50.8	----do	do.
----do	1297	14	39.5	51.3	----do	do.
Sept. 20	1302	12½	39.5	51.2	----do	do.
----do	1303	14	39.4	51.2	----do	do.
----do	1304	14	39.3	51.0	----do	do.
----do	1305	12½	39.3	51.0	Slight red coloration	do.
----do	1306	14	39.3	52.0	----do	do.
----do	1308	14	37.3	51.5	----do	do.
Sept. 25	1310	12½	39.2	51.3	No red coloration	do.
Sept. 15	1312	13	39.3	51.5	----do	do.
Sept. 18	1287	14	39.6	50.5	----do	do.
----do	1289	14½	39.6	50.8	----do	do.
Sept. 19	1290	14	39.7	51.0	----do	do.
----do	1291	15	39.5	51.2	----do	do.
----do	1294	14	39.5	50.8	----do	do.
Sept. 17	1263	14	39.5	51.3	----do	do.
----do	1266	14	39.5	53.0	Decided red coloration	Contains a small amount of cotton-seed oil, due not impossibly to the pigs having been fed cotton-seed meal.
----do	2168	14	39.5	51.3	No red coloration	Contains no cotton-seed oil.
----do	1271	15	39.8	50.4	----do	do.
----do	1272	14	39.8	51.0	----do	do.
----do	1275	14	39.5	52.0	----do	do.
----do	1276	14	39.5	50.3	----do	do.

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1264	Flake White	McCaw Mfg. Co., Macon, Ga.	C. E. Pugh, Greensboro, N. C.
1265	----------	---------- Richmond, Va.	R. A. McCracken, Greensboro, N. C.
1267	----------	Armour Packing Co., Kansas City, Mo.	W. W. Hogshead, Greensboro, N. C.
1269	Snow Drift	Southern Cotton Oil Co., Savannah, Ga.	T. M. Pickard & Co., Greensboro, N. C.
1270	Superior	Armour Packing Co., Kansas City, Mo.	W. B. Young, Greensboro, N. C.
1273	Cottolene	N. K. Fairbanks Co., Chicago, Ill.	J. H. Boone, Greensboro, N. C.
1274	Flake White	McCaw Mfg. Co., Macon, Ga.	J. R. Silver, Greensboro, N. C.
1277	Cottolene	N. K. Fairbanks Co., Chicago, Ill.	Rankin Bros. Grocery Company, Greensboro, N. C.
1279	----------	----------	---------- Greensboro, N. C.
1283	Snow Drift	Southern Cotton Oil Co., Savannah, Ga.	A. P. Grizzard, Winston, N. C.
1284	Flake White	McCaw Mfg. Co., Macon, Ga.	S. O. Bennett, Winston, N. C.
1285	Snow Drift	Southern Cotton Oil Co., Savannah, Ga.	----do----------
1288	----------	Armour Packing Co., Kansas City, Mo.	W. L. Harger, Winston, N. C.
1292	Palmatina	Southern Cotton Oil Co., Savannah, Ga.	C. J. Jeffries, Salisbury, N. C.
1293	----------	Kingan & Co., Indianapolis, Ind.	Ruffity & Misenheimer, Salisbury, N. C.
1296	Palmatina	Southern Cotton Oil Co., Savannah, Ga.	Hall & Griggs, Salisbury, N. C.
1298	Jewel	Swift & Co., Chicago, Ill.	W. M. Harris & Co., Salisbury, N. C.
1299	Palmatina	Southern Cotton Oil Co., Savannah, Ga.	L. G. Hanley, Salisbury, N. C.
1300	White Cloud	Armour & Co., Chicago, Ill.	D. L. Cauble, Salisbury, N. C.
1301	Palmatina	Southern Cotton Oil Co., Savannah, Ga.	M. Moses, Salisbury, N. C.
1307	White Cloud	Armour Packing Co., Chicago, Ill.	McManus, Sharp & Co., Charlotte, N. C.
1309	----------	Forbes & Co., Richmond, Va.	Miller & Campbell, Charlotte, N. C.
1311	Flake White	McCaw Mfg. Co., Macon, Ga.	W. R. Dorsett, Raleigh, N. C.
1313	----------	Armour Packing Co., Chicago, Ill.	Old & Fearing, Elizabeth City, N. C.

TION OF COMPOUND LARD.

Date of Purchase.	Laboratory Number.	Retail Price per Lb.	Butyro-refractometer.		Halphen's Test for Cotton-seed Oil.	Remarks.
			Temperature.	Scale Division.		
		Cts.	°			
Sept. 17	1264	12½	39.5	56.5	Red coloration good	Contains cotton-seed oil product.
----do	1265	11	39.5	55.3	----do	do.
----do	1267	11	39.5	56.3	----do	do.
----do	1269	12½	39.8	55.5	----do	do.
----do	1270	12½	39.8	56.0	----do	do.
----do	1273	12½	39.8	57.2	----do	do.
----do	1274	12½	39.5	56.3	Red coloration strong	do.
----do	1277	12½	39.8	56.8	----do	do.
----do	1279	11	40.0	55.0	----do	do.
Sept. 18	1283	11	40.0	56.0	----do	do.
----do	1284	10	40.0	56.2	----do	do.
----do	1285	10	40.0	55.8	----do	do.
----do	1288	15	40.0	56.0	----do	do.
Sept. 19	1292	13	40.0	56.3	----do	do.
----do	1293	12½	40.0	56.2	----do	do.
----do	1296	12½	40.2	56.5	----do	do.
----do	1298	12½	40.3	56.0	----do	do.
----do	1299	11	40.3	56.3	----do	do.
----do	1300	12½	40.3	55.7	----do	do.
----do	1301	12½	40.0	57.0	----do	do.
Sept. 20	1307	11	40.0	55.5	Red coloration fair	do.
----do	1309	11	40.0	56.2	Red coloration strong	do.
Sept. 25	1311	11	40.0	56.2	----do	do.
Sept. 15	1313	11	40.0	56.2	----do	do.

BAKING POWDERS.

By B. W. Kilgore and W. M. Allen.

Our second report on food products contained the results of the examination of a large number of samples—85—of the various brands of baking powders of the different classes. This time only a few samples have been tested, the quantitative analysis being limited to the estimation of the carbonic acid gas (the active leavening constituent to which powders owe their value), though qualitative tests were made to ascertain the materials from which the powders were compounded, as well as any impurities or adulterants.

As stated in a former report, bicarbonate of soda is the constituent which carries the carbonic acid gas in all baking powders, the acid material or materials employed for liberating this gas in the baking process determining the class to which each powder belongs, as follows:

Cream of Tartar Powders.—Only two samples of powders having cream of tartar as the constituent for setting free the leavening gas were examined, both being of good strength and quality, as the results show.

Alum Powders.—Five samples, representing three brands of powders, in which alum was used for liberating the carbonic acid gas, were tested; the strength of all, as shown by the percentage of gas they contained, was good. The residues left in bread, after the baking process, from the use of the different powders have been given in a former report (September Bulletin, 1902, pages 13-19), and their effects on the system discussed. This matter need not, therefore, be repeated here, but the attention of those interested in baking powders—what they contain and what they leave in the bread—is directed to that report.

Phosphate Powders.—Four samples of this class, representing two brands, were analyzed. Acid phosphate of lime is used in this class of powders for setting free the carbonic acid gas. The quality and strength of the samples tested were good, as shown by the results.

Calcium sulphate was found present in the samples of Horsford's Bread Preparation examined for this, as well as for the previous report. In the September (1902) Bulletin Horsford's (meaning Horsford's Bread Preparation) was classed as an adulterated baking powder, because of the presence in it of calcium sulphate, which was considered as added filler to give bulk and weight. Attention having been called to this, careful examinations have been made of the statements and claims of the manufacturers and the patents under which the Bread Preparation is made. These convince us that the calcium sulphate in this powder is not added filler, but is a constituent formed in the regular process of the manufacture of this powder, and has always been present in it since its first appearance on the market in 1856. It should be further stated here that experiments by Wadman (1) and others show that "process" calcium sulphate (in finely divided condition as formed in the manufacture of the acid phosphate of lime for use in this class of powders) takes a part in the chemical changes in phosphate powders, aiding in the setting free of the leavening gas and being at the same time changed from calcium sulphate to sodium sulphate. (The residue left in bread from the use of this

powder would then be mainly sodium sulphate and tri-calcium phosphate, the effects of which, on the human system, were discussed in the September, 1902, BULLETIN). Had these facts been before us in the preparation of the September (1902) BULLETIN, Horsford's Bread Preparation would not have been classed as adulterated and its sale illegal. This statement is made to counteract any injustice done by the earlier report, and carries with it the understanding that the product in question is a legitimate one in the light of our food law.

To be fully understood, it should be stated here that in case the calcium sulphate were present by *addition*, or produced in the process of manufacture materially beyond what would be necessary to take part in the change referred to above, it would be considered an adulterant in this class of powders—the phosphate ones. In both of the other classes of powders it is considered an adulterant, as it has no part in the liberation of the leavening gas in them and remains in them as such.

METHODS OF ANALYSIS.

Total Carbon Dioxide.—The absorption method described by Fresenius, modified by Heidenhain, was employed. A 10 per cent hydrochloric acid was used to liberate the gas. It was dried by calcium chloride, washed with sulphuric acid solution of silver sulphate to free from hydrochloric acid, and absorbed by soda lime in weighed U-tubes. (2) Duplicate determinations were made on each sample.

Residual Carbon Dioxide.—Methods described by McGill and Catlin were used for this determination. Weigh 2 grams of sample in a flask suitable for the subsequent determination, add 20 c. c. of cold water and let stand for twenty minutes. Place a flask in a bath at the temperature of boiling water, and with occasional shaking, heat for twenty minutes. To complete reaction, heat quickly to boiling and boil for one minute. Aspirate until air in flask is changed. Determine the residual carbon dioxide by method for total carbon dioxide.

Available Carbon Dioxide.—To obtain the available carbon dioxide, subtract the residual from the total. (2)

Insoluble Ash.—Ignite two grams to destroy organic matter. Treat with hydrochloric acid, filter, wash the residue, dry and weigh.

(2) Connecticut Experiment Station, Report for 1900, Part II, p. 169.

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1716	Rumford	Rumford Chemical Works, Providence, R. I.	M. Rosenthal, Raleigh, N. C.
1717	Horsford's Self-raising Bread Preparation.	do	do
1718	Rumford	do	J. R. Ferrall & Co., Raleigh, N. C.
1719	Horsford's Self-raising Bread Preparation.	do	do
1720	Rumford	do	John S. Jones, Raleigh, N. C.

RESULTS OF THE EXAMINATION OF

1721	Carolina	H. R. Horne & Sons, Fayetteville, N. C.	J. R. Ferrall & Co., Raleigh, N. C.
1722	Royal	Royal Baking Powder Co., New York, N. Y.	do

RESULTS OF THE EXAMINATION

1723	Good Luck	The Southern Mfg. Co., Richmond, Va.	M. Rosenthal, Raleigh, N. C.
1724	Parrot and Monkey.	The Sea Gull Specialty Co., Baltimore, Md.	J. R. Ferrall & Co., Raleigh, N. C.
1725	Good Luck	The Southern Mfg. Co., Richmond, Va.	do
1726	Parrot and Monkey.	The Sea Gull Specialty Co., Baltimore, Md.	John S. Jones, Raleigh, N. C.
1727	Rex (One Spoon)	J. D. & R. S. Christian Co., Richmond, Va.	W. B. Mann, Raleigh, N. C.

ACID PHOSPHATE BAKING POWDERS.

Date of Purchase.	Laboratory Number.	Cost of Package.	Cost per Pound.	Weight of Contents of Package.	Carbonic Acid.			Ash Insoluble in Hydrochloric Acid.
					Available.	Residual.	Total.	
		Cts.	Cts.	Lbs.				
Dec. 17, 1902---	1716	15	30	0.5	10.76	0.70	11.46	0.09
----do ---------	1717	15	21	0.7	12.45	2.95	15.40	0.03
----do ---------	1718	15	30	0.5	11.04	0.08	11.12	0.06
----do ---------	1719	15	21	0.7	14.95	0.83	15.78	0.04
----do ---------	1720	15	30	0.5	10.58	0.54	11.12	0.09

CREAM OF TARTAR BAKING POWDERS.

		Cts.	Cts.	Lbs.				
Dec. 17, 1902---	1721	20	40	0.5	13.17	0.20	13.37	0.02
----do ---------	1722	25	50	0.5	12.00	0.80	12.80	0.02

OF ALUM BAKING POWDERS.

		Cts.	Cts.	Lbs.				
Dec. 17, 1902---	1723	10	11	0.9	14.70	0.20	14.90	0.10
----do ---------	1724	5	8	0.6	15.73	0.95	16.68	0.05
----do ---------	1725	5	12	0.4	14.11	0.80	14.91	0.09
----do ---------	1726	5	8	0.6	14.89	0.88	15.77	0.09
----do ---------	1727	10	10	1.0	16.44	0.16	16.60	0.04

FLOUR.

By F. C. Lamb.

Flour is the interior portion of grain, usually wheat, separated from the bran or husks and reduced to its finely divided state by repeated crushing and bolting. The protein is one of the most important parts of flour, and consists of a number of nitrogenous substances, the most valuable of which in flour is gluten. The highest-priced flour may not be the most nutritious, as the whiter ones are usually the most expensive, while the darker ones are likely to con-

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1362	DeSoto	Dan Valley Mills, Danville, Va.	Rankin Bros. Grocery Company, Greensboro, N. C.
1363	Snow Drift	Jas. I. Triplett, Woodstock, Va.	----do
1364	White Clover	Riverton Milling Co., Riverton, Va.	Tucker & Erwin, Greensboro, N. C.
1365	DeSoto	Liberty Mills, Nashville, Tenn.	----do
1366	Best Patent	Jas. I. Triplett, Woodstock, Va.	----do
1367	Crystal	W. B. Baker & Sons, Winchester, Va.	----do
1368	Oak Ridge	Dan Valley Milling Co., Danville, Va.	----do
1369	DeSoto	Liberty Mills, Nashville, Tenn.	Hiatt & Lamb, Greensboro, N. C.
1370	Seafoam	W. B. Baker & Sons, Winchester, Va.	----do
1371	White Rose	----------	Fletcher & Rhodes, Greensboro, N. C.
1372	Best Patent	Dan Valley Mills, Danville, Va.	S. E. Hudson, Greensboro, N. C.
1373	----do	Guilford Roller Mills, Greensboro, N. C.	----do
1374	DeSoto	Dan Valley Mills, Danville, Va.	J. R. Foster & Co., Greensboro, N. C.
1375	Baker's Choice	Guilford Roller Mills, Greensboro, N. C.	----do
1376	Best Patent	----do	----do
1377	White Rock	S. C. Hurt & Sons, Lynchburg, Va.	----do
1378	DeSoto	Liberty Mills, Nashville, Tenn.	E. C. Pugh, Greensboro, N. C.
1379	Silver Star	Julian Milling Co., Julian, N. C.	----do
1380	Oak Ridge	Dan Valley Milling Co., Danville, Va.	----do
1381	Best Patent	Valley Roller Mills, Woodstock, Va.	----do
1382	DeSoto	Dan Valley Milling Co., Danville, Va.	G. W. Denny, Greensboro, N. C.
1383	Peach Blow	Jas. I. Triplett, Woodstock, Va.	----do
1384	Best Patent	----do	J. H. Boone, Greensboro, N. C.

tain more protein, on account of less complete separation of inner and outer parts. Seventy samples of flour were analyzed, the per cent of protein ranging from 9.75 to 14.81.

White and finely ground mineral has been occasionally used for the adulteration of flour. This form of deception would be revealed by an increase in the amount of ash. The quantity of ash in flour varies from .25 per cent to .75 per cent. There is, therefore, no room to suspect adulteration of this kind in the samples examined.

Corn being usually cheaper than wheat, finely ground products from corn, composed mostly of corn starch, have been more largely used than anything else for the adulteration of flour. The microscope is used for detecting this form of sophistication, being based on the difference in size and form of the starch products in the different grains.

One sample, No. 1714, was found to be thus adulterated.

NATION OF FLOUR.

Date of Purchase.	Laboratory Number.	Retail Price per Barrel.	Chemical Analysis Showed the Following Percentages of—			Microscopic Examination Showed Sample to be—
			Water.	Ash.	Protein.	
1902.						
September 16--	1362	$ 5.20	12.39	.34	12.94	Pure wheat flour.
----do ----------	1363	5.50	12.66	.39	12.06	do.
----do ----------	1364	5.00	11.98	.40	11.56	do.
----do ----------	1365	5.00	12.12	.36	10.75	do.
----do ----------	1366	5.20	11.83	.36	12.94	do.
----do ----------	1367	5.40	12.10	.53	11.69	do.
----do ----------	1368	5.00	12.68	.49	14.31	do.
----do ----------	1369	4.75	12.72	.42	13.13	do.
----do ----------	1370	5.50	12.06	.50	12.06	do.
----do ----------	1371	4.70	12.13	.48	12.25	do.
----do ----------	1372	5.50	12.06	.37	11.69	do.
----do ----------	1373	5.00	11.82	.41	11.50	do.
----do ----------	1374	5.00	12.17	.36	14.06	do.
----do ----------	1375	4.50	12.10	.41	14.81	do.
----do ----------	1376	5.00	11.45	.39	12.94	do.
----do ----------	1377	4.50	11.78	.45	12.81	do.
----do ----------	1378	4.75	11.15	.34	10.81	do.
----do ----------	1379	4.75	11.72	.48	12.69	do.
----do ----------	1380	4.50	11.90	.53	12.19	do.
September 17--	1381	5.00	11.87	.32	12.13	do.
----do ----------	1382	5.00	12.09	.36	13.06	do.
----do ----------	1383	5.00	12.17	.35	11.75	do.
----do ----------	1384	5.20	11.81	.35	10.00	do.

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1385	Silver Leaf	Dan Valley Milling Co., Danville, Va.	Shaw Bros. & Co., Greensboro, N. C.
1386	Monarch	J. I. Triplett, Woodstock, Va.	do
1387	Ideal	W. B. Baker's Sons, Winchester, Va.	A. P. Grizzard, Winston, N. C.
1388	Pride of Salem	Wachovia Mills, Winston, N. C.	S. O. Bennett, Winston, N. C.
1389	St. Elmo	Mountain City Milling Co., Chattanooga, Tenn.	F. H. Farabee, Winston, N. C.
1390	Magnolia	Wallburg Roller Mills, Wallburg, N. C.	do
1391	White Swan	Tennessee Milling Co., Estill Springs, Tenn.	do
1392	Rising Sun	Forsyth Roller Mills, Winston, N. C.	do
1393	Paragon	Hardesty Bros., Columbus, O.	Griffith & Lentz, Winston, N. C.
1394	Royal Crown		do
1395	Electric Light	Asheville Milling Co., Asheville, N. C.	W. L. Harger, Winston, N. C.
1396	White Eagle	Gambill & Davis, Roanoke, Va.	do
1397	Winston's Queen	Forsyth Roller Mills, Winston, N. C.	Nash & McGehee, Winston, N. C.
1398	Rising Sun	do	do
1399	Majestic	Knoxville City Mills, Knoxville, Tenn.	Theo. Atwell, Salisbury, N. C.
1400	do	Liberty Mills, Nashville, Tenn.	C. J. Jeffries, Salisbury, N. C.
1401	do	Knoxville City Mills, Knoxville, Tenn.	do
1402	New Process	White Star Mills, Staunton, Va.	Hall & Griggs, Salisbury, N. C.
1403	Our Patent		W. M. Harris & Co., Salisbury, N. C.
1404	Majestic	Knoxville City Mills, Knoxville, Tenn.	L. F. Hanly, Salisbury, N. C.
1405	Alpine Snow	J. Allen Smith, Knoxville, Tenn.	J. A. Barrett, Salisbury, N. C.
1406	Gilt Edge	Northside Roller Mills, Salisbury, N. C.	do
1407	Majestic	Liberty Mills, Nashville, Tenn.	N. P. Murphy, Salisbury, N. C.
1408	Nellie King	Tennessee Milling Co., Estill Springs, Tenn.	M. Moses, Salisbury, N. C.
1409	Crystal	Statesville Flour Mill, Statesville, N. C.	W. H. Wallace, Salisbury, N.C.
1410	Melrose	White Star Mills, Staunton, Va.	Bridgers & Co., Charlotte, N.C.
1411	do	do	S. H. Youngblood, Charlotte, N. C.
1412	Roller Champion	Valley City Mills, Grand Rapids, Mich.	J. M. Sims, Charlotte, N. C.
1413	Pride of Charlotte	Mecklenburg Mills, Charlotte, N. C.	J. A. Van Ness & Bro., Charlotte, N. C.
1414	Roller Champion	Valley City Mills, Grand Rapids, Mich.	do
1415	White Sponge	W. S. Jenkins & Co., Leesburg, Va.	W. L. Pope, Charlotte, N. C.
1416	Gossip	Hughes Milling Co., , Ill.	N. Duls, Charlotte, N. C.
1417	Roller Champion	Valley City Mills, Grand Rapids, Mich.	do
1418	White Lily	Mecklenburg Milling Co., Charlotte, N. C.	Miller & Campbell, Charlotte, N. C.
1419	Sublime	J. D. Manor & Co., New Market, Va.	E. M. Smith, Raleigh, N. C.
1420	North State	Farina Milling Co., Raleigh, N. C.	do
1421	Ballard's Waterloo	Ballard & Ballard, Louisville, Ky.	do

NATION OF FLOUR—CONTINUED.

Date of Purchase.	Laboratory Number.	Retail Price per Barrel.	Chemical Analysis Showed the Following Percentages of—			Microscopic Examination Showed Sample to be—
			Water.	Ash.	Protein.	
1902.						
September 17	1385	$ 5.00	11.32	.41	11.19	Pure wheat flour.
----do	1386	5.00	11.77	.38	12.56	do.
September 18	1387	5.50	11.60	.44	11.63	do.
----do	1388	5.00	11.92	.43	11.19	do.
----do	1389	5.00	11.92	.49	12.06	do.
----do	1390	4.50	11.82	.51	9.88	do.
----do	1391	4.00	11.00	.59	12.50	do.
----do	1392	4.50	12.07	.41	14.81	do.
----do	1393	4.80	13.88	.47	13.75	do.
----do	1394	5.00	12.37	.34	12.13	do.
----do	1395	4.50	12.39	.39	13.63	do.
----do	1396	4.50	11.87	.42	14.50	do.
----do	1397	5.50	12.17	.40	11.50	do.
----do	1398	5.00	12.09	.45	12.44	do.
September 19	1399	5.30	14.03	.36	10.69	do.
----do	1400	5.00	12.37	.37	11.88	do.
----do	1401	5.00	13.19	.37	11.06	do.
----do	1402	4.50	12.16	.47	14.06	do.
----do	1403	5.20	12.59	.43	11.19	do.
----do	1404	5.20	13.83	.56	10.94	do.
----do	1405	4.40	11.84	.68	12.94	do.
----do	1406	4.40	11.92	.46	11.81	do.
----do	1407	4.80	12.16	.37	11.88	do.
----do	1408	4.80	11.96	.39	11.31	do.
----do	1409	4.80	12.74	.41	10.88	do.
September 20	1410	5.00	13.19	.38	10.81	do.
----do	1411	5.00	12.18	.34	10.88	do.
----do	1412	5.75	12.59	.39	11.51	do.
----do	1413	5.00	12.30	.38	10.75	do.
----do	1414	5.75	12.50	.37	10.00	do.
----do	1415	4.80	12.44	.52	10.50	do.
----do	1416	4.75	11.87	.44	14.12	do.
----do	1417	6.00	12.23	.27	11.12	do.
----do	1418	4.00	12.12	.45	9.75	do.
September 25	1419	5.25	12.32	.43	11.50	do.
----do	1420	5.25	12.49	.45	11.69	do.
----do	1421	4.00	11.69	.80	13.75	do.

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1422	Champion	J. I. Triplett, Woodstock, Va.	M. Rosenthal, Raleigh, N. C.
1423	Cream of the Pantry.	Rockland Milling Co., Weyers Cave, Va.	B. W. Upchurch, Raleigh, N. C.
1424	Elk	Cairo Milling Co., Cairo, Ill.	do
1425	Quakers Gold Dust	Phillips & Penny, Jobbers, Raleigh, N. C.	W. R. Dorsett, Raleigh, N. C.
1426	Royal Patent	Doigt Milling Co., Grand Rapids, Mich.	Old & Fearing, Elizabeth City, N. C.
1427	Obelisk	Ballard & Ballard, Louisville, Ky.	Fulmer & Whitehurst, Elizabeth City, N. C.
1171			*A. J. McBride, Mast, N. C.
1199			*J. B. Johnson, Mocksville, N. C.
1713	Nellie King	Tennessee Milling Co., Estill Springs, Tenn.	*Asheville Milling Co., Asheville, N. C.

*Samples sent by these parties for examination.

CORN MEAL.

By F. C. Lamb.

Meal is obtained from corn by separating the interior portion from the husks by grinding and bolting. It is largely used in the Southern States as a human food.

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1447	Corn meal	Forsyth Roller Mills, Winston, N. C.	Rankin Bros. Grocery Co., Greensboro, N. C.
1448	do	S. C. Hurt & Co., Lynchburg, Va.	Tucker & Erwin, Greensboro, N. C.
1449	do	W. A. Watson, Greensboro, N. C.	do
1450	do	do	Hiatt & Lamb, Greensboro, N. C.
1451	do	S. C. Hurt & Co., Lynchburg, Va.	Fletcher & Rhodes, Greensboro, N. C.
1452	do	W. A. Watson, Greensboro, N. C.	S. E. Hudson, Greensboro, N. C.
1453	do	do	J. R. Foster & Co., Greensboro, N. C.
1454	do	do	G. W. Denny, Greensboro, N. C.
1455	Peerless	J. Allen Smith & Co., Knoxville, Tenn.	Hall & Griggs, Salisbury, N. C.
1456	do	do	W. M. Harris & Co., Salisbury, N. C.
1457	do	do	D. L. Cauble, Salisbury, N. C.
1458	Corn meal	Cumberland Mills, Nashville, Tenn.	M. Moses, Salisbury, N. C.
1459	do	Adams Grain and Provision Co., Charlotte, N. C.	Bridgers & Co., Charlotte, N. C.
1460	Choice Water Ground.	Hazel Green Mills, Asheville, N. C.	McManus, Sharp & Co., Charlotte, N. C.
1461	Dunlap	Walter Moore & Co., Richmond, Va.	W. R. Dorsett, Raleigh, N. C.
1462	Corn meal	Elizabeth City Milling Co., Elizabeth City, N. C.	Old & Fearing, Elizabeth City, N. C.
1463	do	N. R. Zimmerman & Co., Elizabeth City, N. C.	Fulmer & Whitehurst, Elizabeth City, N. C.

NATION OF FLOUR—CONTINUED.

Date of Purchase.	Laboratory Number.	Retail Price per Barrel.	Chemical Analysis Showed the Following Percentages of—			Microscopic Examination Showed Sample to be—
			Water.	Ash.	Protein.	
1902.						
September 25--	1422	$ 5.00	12.45	.39	11.50	Pure wheat flour.
----do ----------	1423	4.00	12.81	.46	12.25	do.
----do ----------	1424	4.50	12.20	.35	10.44	do.
----do ----------	1425	4.50	12.13	.57	12.81	do.
September 15--	1426	4.50	13.93	.33	9.99	do.
----do ----------	1427	4.25	11.96	.37	12.50	do.
----------	1171	----------	----------	.39	10.06	do.
----------	1199	----------	----------	.73	12.00	do.
----------	1713	----------	----------	.39	10.44	do.

Seventeen samples were analyzed. The per cent of protein ranged from 9.50 to 13.58 per cent.

The microscopic examination was made by Mr. Gerald McCarthy, and with the chemical test showed that there was no adulteration.

NATION OF MEAL.

Date of Purchase.	Laboratory Number.	Retail Price per Bushel.	Chemical Analysis Showed the Following Percentages of—			Microscopic Examination Showed These Materials to be—
			Water.	Ash.	Protein.	
1902.						
September 16--	1447	$ .95	12.05	1.17	13.58	Corn meal.
----do ----------	1448	1.00	12.03	1.34	10.12	do.
----do ----------	1449	1.00	11.85	1.23	10.69	do.
----do ----------	1450	.95	12.40	1.33	10.56	do.
----do ----------	1451	.90	12.49	1.26	9.50	do.
----do ----------	1452	1.00	12.12	1.29	10.94	do.
----do ----------	1453	1.00	12.14	1.22	10.06	do.
September 17--	1454	1.00	11.41	1.24	9.75	do.
September 19--	1455	.95	12.49	1.09	10.06	do.
September 17--	1456	.90	12.97	1.15	9.81	do.
----do ----------	1457	1.00	12.78	1.13	10.25	do.
----do ----------	1458	1.00	12.21	.94	10.94	do.
September 20--	1459	.90	12.58	1.12	11.06	do.
----do ----------	1460	.90	12.01	1.26	12.25	do.
September 25--	1461	.95	11.24	1.29	11.06	do.
September 15--	1462	.80	12.48	1.13	10.87	do.
----do ----------	1463	.80	11.29	1.21	9.75	do.

COMMERCIAL STOCK FEEDS.

By F. C. Lamb.

Commercial stock feeds are bought mainly to supply sufficient protein to make well-balanced rations with the coarse hays, corn fodder, ensilage, corn meal, etc., already on the farm. These coarser feeds contain large amounts of starch, sugar and fat, but are deficient in protein. One hundred and sixty-two (162) samples of commercial feed stuffs were analyzed, as follows:

Wheat bran	30
Ship-stuff (chops)	21
Shorts	2
Cotton-seed meal	85
Miscellaneous	24
Total	162

Cotton-seed Meal is one of the products from oil mills. The seed are cut by machinery, the kernels partially separated from the outer hulls and the oil incompletely separated by crushing, heating and expressing through cloths by the use of hydraulic pressure. A hard cake is formed and this is sometimes sold as such, though more commonly ground and sold as meal.

It has already been stated that protein is not only one of the most important, but at the same time one of the most costly constituents of feeds. It is a material that produces lean meat and muscle, and is especially efficacious in promoting and increasing the flow of milk. The main value of cotton-seed meal as a feed depends on the presence of a large amount of this important material—protein—though it contains, in addition, quite a considerable percentage (8 to 10, or more) of fat.

Good grades of cotton-seed meal contain 43 or more per cent of protein. This means that they have about 7 per cent of nitrogen, which is equal to 8.5 per cent of ammonia. Meals, in past years especially, have not infrequently been considerably better than this. Of the 85 samples of meal analyzed, only 24 contained 43 or more per cent of protein; twenty (20) samples ranged from 41 to 43 per cent of protein, which is equal to 6.6 to 7 per cent of nitrogen, or 8 to 8.5 per cent of ammonia; thirty-four (34) samples contained from 38.6 to 41 per cent of protein, which is equal to 6.2 to 6.6 per cent of nitrogen, or 7.5 to 8 per cent of ammonia. There were seven (7) samples even below 38.6 per cent of protein, the lowest being 36.31 per cent.

Twenty-four (24) samples of cotton-seed meal were analyzed for our first report in the December (1900) Bulletin. Only three of these had less than 42 per cent of protein, and none had less than 41 per cent, showing that there has been a marked decrease in the quality of this extremely important feed during the two years 1901 and 1902.

Forty-eight per cent, nearly one-half of the output, as measured by the samples analyzed, was of materially lower quality than that made in the year 1900.

Wheat Bran is a by-product from the manufacture of flour. To be of good quality it should contain 15.5 per cent of protein. Of the thirty (30) samples analyzed, ten, or 33.3 per cent, contained less than 15.5 per cent, the lowest being 10.95 per cent. Samples Nos. 1085 and 1488, manufactured by the Mountain Milling Company, Chattanooga, Tenn., and the Atlanta Milling Company, Atlanta, Ga., respectively, are of very poor quality.

Ship-stuff.—Of the twenty-one (21) samples analyzed, there were eight which contained less than 15.5 per cent of protein, the two lowest (No. 1498, sold by the Richmond Flour and Feed Company, Richmond, Va., jobbers, and No. 1510, by N. R. Savage & Son, Richmond, Va.) containing 9.81 and 8.06 per cent. The ash content of these two samples were, respectively, 8.91 and 5.67, showing that they contained foreign material.

Materials Seriously Adulterated.—Especial attention should be drawn to two samples, Nos. 1132 and 1223. These are "Oat Feed," sold by the Richmond Flour and Feed Company, Richmond, Va., and sent in for examination by M. C. Braswell, Battleboro, and the Naomi Falls Store Company, Randleman. These feeds were largely oat hulls ground with mill sweepings, some corn meal and wheat bran, and had very little value. Stock, in fact, as reported by the senders of the samples, could hardly, if at all, be induced to eat the stuff, though it was sold for a good price, about $22 per ton. The same may be said regarding sample No. 1256, "Mixed Feed," the manufacturer of which is not known to us.

RESULTS OF THE EXAMINATION

Laboratory Number.	Name of Material.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1134	Cotton-seed meal	Laurinburg Oil Co., Laurinburg, N. C.	
1136	do	Havens Oil Co., Washington, N. C.	
1139	do	do	
1141	do	do	
1142	do		*R. H. Denton, Tarboro
1143	do		do
1144	do		do
1148	do	Swift Creek Mfg. Co., Wrendale, N. C.	
1152	do	Lenoir Oil and Ice Co., Kinston, N. C.	
1153	do	do	
1157	do	Selma Oil Mills, Selma, N. C.	*Alex. Aycock & Bro., Fremont
1159	do	Rocky Mount Oil and Fertilizer Works, Rocky Mount, N. C.	*A. H. Ricks, Gold Rock
1160	do	Havens Oil Co., Washington, N. C.	*J. Bryan Grimes, Raleigh
1161	do	Rowland Oil and Fertilizer Co., Rowland, N. C.	
1163	do	Tarboro Oil Mills, Tarboro, N. C.	*R. Gardner, Scotland Neck
1166	do		*J. L. Britt, Chocowinity
1170	do	Gastonia Oil Mills, Gastonia, N. C.	*L. H. Coffey, Pollettsville
1172	do		*C. W. Bowen, Surry
1197	do	Havens Oil Co., Washington, N. C.	
1198	do	Rocky Mount Oil Mills, Rocky Mount, N. C.	*E. M. Stone, Rocky Mount
1200	do	Havens Oil Co., Washington, N. C.	*W. E. Page, Tarboro
1201	do	do	do
1202	do	do	do
1203	do		*Continental Plant Co., Kittrell
1208	do	N. C. Cotton Oil Co., Charlotte, N. C.	*E. B. Hodges, Greensboro
1209	do	do	do
1210	do	Selma Oil Co., Selma, N. C.	*B. J. Keech, Tarboro
1211	do	N. C. Cotton Oil Co., Wilmington, N. C.	do
1212	do	Havens Oil Co., Washington, N. C.	
1213	do	Spartanburg Oil Mill, Spartanburg, S. C.	*J. S. Holmes, Bowman's Bluff
1215	do	Rocky Mount Oil Mill, Rocky Mount, N. C.	*B. F. Shelton, Speed
1217	do	Shiloh Oil Mills, N. C.	*W. H. McNair, Tarboro
1218	do		*T. P. Shields, Scotland Neck
1219	do		*M. W. McLean, Raeford
1222	do		*J. N. McLauchlin Co., Raeford
1225	do		*Thos. Felton & Son, Sun

*Samples sent by these parties for examination.

OF COMMERCIAL STOCK FEEDS.

Date of Purchase.	Laboratory Number.	Retail Price per Ton.	Water.	Ash.	Ether Extract (Fat or Oil).	Protein.	Microscopic Examination Shows These Materials to be or to Contain—
1901 and 1902.							
	1134			7.32	9.84	44.38	
	1136			7.33	12.17	44.93	
	1139			6.89	8.52	45.19	
	1141			7.18	8.59	46.56	
	1142			9.09	9.84	39.75	
	1143			7.25	10.14	39.56	
	1144			7.11	11.82	40.50	
	1148			7.48	10.69	40.75	
	1152			7.17	9.95	42.81	
	1153			6.99	8.68	39.31	
	1157			6.58	9.42	37.62	
	1159			6.94	7.94	41.31	
	1160			7.89	13.35	41.94	
	1161			6.98	10.68	42.00	
	1163			6.73	16.10	40.13	
	1166			7.07	9.44	41.50	
	1170			7.00	9.28	45.44	
	1172			7.02	9.55	42.37	
	1197			6.87	9.59	43.75	
	1198			6.59	10.37	37.88	
	1200			7.36	8.58	40.69	
	1201			7.49	12.50	43.81	
	1202			7.70	9.28	45.00	
	1203			6.31	7.98	38.50	
	1208			7.45	11.02	41.12	
	1209			7.22	11.68	40.19	
	1210			7.32	8.55	39.25	
	1211			6.58	14.47	37.31	
	1212			7.04	13.61	41.94	
	1213			7.07	7.54	39.13	
	1215			7.32	10.08	39.56	
	1217			7.23	8.90	41.00	
	1218			7.79	12.33	41.12	
	1219			7.75	7.50	38.31	
	1222			6.71	7.99	39.06	
	1225			7.53	9.19	41.00	

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Name of Material.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1226	Cotton-seed meal		*Thos. Felton & Son, Sun
1227	----do		----do
1228	----do	Gastonia Mills, Gastonia, N. C.	*J. N. McLauchlin, Raeford
1230	----do	Conetoe Cotton-seed Oil Mills, Conetoe, N. C.	*J. W. Jones, Tarboro
1232	----do	Southern Cotton Oil Co., Charlotte, N. C.	*H. H. Ray, Rock Fish
1233	----do	Southern Cotton Oil Co., Fayetteville, N. C.	*M. F. Edwards, Lemon Springs
1236	----do	Southern Cotton Oil Co., Rocky Mount, N. C.	*D. Powell, Rocky Mount
1239	----do	Goldsboro Oil Mill, Goldsboro, N. C.	*H. C. Bragaw, Washington
1240	----do	Havens Oil Co., Washington, N. C.	*W. H. Rives, Greenville
1067	----do	Piedmont Oil Co., Shelby, N. C.	
1071	----do	N. C. Cotton Oil Co., Raleigh, N. C.	*James Moore, Raleigh
1075	----do		*C. A. Usher, Chadbourn
1076	----do		*J. C. Gibson, Antioch
1077	----do		----do
1078	----do		*B. T. Harris, Hester
1079	----do	Fayetteville Cotton Oil Co., Fayetteville, N. C.	*A. T. McCallum, Red Springs
1080	----do	Cotton Oil Mill, Gastonia, N. C.	
1081	----do	Charlotte Oil and Fertilizer Co., Charlotte, N. C.	
1083	----do	Cotton-seed Oil Co., Davidson, N. C.	
1084	----do		*J. W. B. Battle, Tarboro
1087	----do		*J. W. Chisholm, Raeford
1088	----do		*J. N. McLauchlin, Raeford
1090	----do		*L. J. Baker, Palmyra
1130	----do		*T. B. Parker, Hillsboro
1135	----do	Laurinburg Oil Co., Laurinburg, N. C.	
1140	----do	Havens Oil Co., Washington, N. C.	
1145	----do		*P. G. Smith, Raleigh
1146	----do		*O. K. Taylor, Scotland Neck
1147	----do		----do
1149	----do	Tar River Oil Co., Tarboro, N. C.	
1150	----do	----do	
1151	----do	----do	
1154	----do	Havens Oil Co., Washington, N. C.	
1155	----do	Rowland Oil and Fertilizer Co., Rowland, N. C.	
1156	----do	Wilson Oil Mills, Wilson, N. C.	*Alex. Aycock & Bro., Fremont.
1158	----do	Rocky Mount Oil and Fertilizer Works, Rocky Mount, N. C.	*G. D. Britt, Tarboro

*Samples sent by these parties for examination.

COMMERCIAL STOCK FEEDS—CONTINUED.

Date of Purchase.	Laboratory Number.	Retail Price per Ton.	Water.	Ash.	Ether Extract (Fat or Oil).	Protein.	Microscopic Examination Shows these Materials to be or to Contain—
1901 and 1902.							
	1226			7.54	8.75	41.31	
	1227			7.62	8.75	42.06	
	1228			6.16	8.30	38.25	
	1230			7.70	9.13	40.69	
	1232			6.32	10.13	38.63	
	1233			7.50	7.40	38.81	
	1236			7.44	10.63	39.81	
	1239			7.45	8.20	39.75	
	1240			7.26	7.87	43.69	
	1067					46.25	
	1071					42.38	
	1075					40.75	
	1076					47.25	
	1077					48.13	
	1078					43.88	
	1079					47.56	
	1080					44.38	
	1081					50.69	
	1083					47.50	
	1084					42.63	
	1087					46.88	
	1088					45.00	
	1090					50.25	
	1130					46.87	
	1135					40.44	
December 21	1140					45.38	
	1145					41.06	
	1146					39.00	
	1147					42.13	
	1149					42.25	
	1150					42.06	
	1151					40.81	
	1154					42.31	
	1155					40.81	
	1156					39.75	
	1158					40.18	

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Name of Material.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1162	Cotton-seed meal	New Bern Cotton Oil and Fertilizer Co., New Bern, N. C.	
1167	do	, Tarboro, N. C.	*F. P. Shields, Scotland Neck
1168	do		*Ben Waters, Fremont
1216	do	Edgecombe Oil Mills, Tarboro, N. C.	*W. H. McNair, Tarboro
1254	do	Southern Cotton Oil Co., Tarboro, N. C.	, Kelford
1255	do	Southern Cotton Oil Co., Fayetteville, N. C.	, Jonesboro
1261	do	Gastonia Mills, Gastonia, N. C.	*W. J. Hutchison, Charlotte
1262	do	Havens Oil Co., Washington, N. C.	
1464	do	do	
1623	do	Conetoe Oil Mills, Conetoe, N. C.	
1702	do	Havens Oil Co., Washington, N. C.	
1703	do	St. Lewis Oil Mill, St. Lewis, N. C.	
1704	do	Lenoir Oil and Ice Co., Kinston, N. C.	
1173	Bran	Dan Valley Milling Co., Danville, Va.	J. W. Isler, Goldsboro
1178	do	Lynchburg Mill Co., Lynchburg, Va.	*J. S. McEachern & Sons, Wilmington.
1185	do	J. E. M. Milling Co., Frankfort, Ky.	do
1085	do	Mountain Milling Co., Chattanooga, Tenn.	*E. McK. Goodwin, Morganton
1086	do		* Holloway, Raleigh
1204	do		*R. B. Hunter, Brinkleyville
1205	do		do
1206	do	Stuart's Draft Milling Co., Stuart's Draft, Va.	do
1207	do		*John P. Bowie, Washington
1259	do	Clark Milling Co., Augusta, Ga.	*E. R. Meares, Clarkton
1474	do	Dan Valley Milling Co., Danville, Va.	Tucker & Erwin, Greensboro
1475	do	, Tate (Jobber)	do
1476	do	J. W. Jones, Brown Summit, N. C.	Hiatt & Lamb, Greensboro
1477	do	Tennessee Milling Co., Tenn.	Fletcher & Rhodes, Greensboro
1478	do	Guilford Roller Mills, Greensboro, N. C.	S. E. Hudson, Greensboro
1479	do	Tennessee Milling Co., Estill Springs, Tenn.	J. R. Foster & Co., Greensboro
1480	do	Liberty Mills, Nashville, Tenn.	E. C. Pugh, Greensboro
1481	do	Dan Valley Mills, Danville, Va.	do
1482	do	N. R. Savage & Son, Richmond, Va.	D. M. Miller, Salisbury
1483	do	Atlanta Milling Co., Atlanta, Ga.	W. M. Harris & Co., Salisbury
1484	do	Tyson (Jobber), Salisbury, N. C.	L. F. Hanley, Salisbury
1485	do	Tennessee Milling Co., Estill Springs, Tenn.	M. Moses, Salisbury
1487	do	Mecklenburg Milling Co., Charlotte, N. C.	Miller & Campbell, Charlotte

*Samples sent by these parties for examination.

COMMERCIAL STOCK FEEDS—CONTINUED.

Date of Purchase.	Laboratory Number.	Retail Price per Ton.	Water.	Ash.	Ether Extract (Fat or Oil.)	Protein.	Microscopic Examination Shows These Materials to be or to Contain—
1901 and 1902.							
----------	1162	$------	---------	---------	---------	41.25	
----------	1167	---------	---------	---------	---------	39.93	
----------	1168	---------	---------	---------	---------	38.81	
----------	1216	---------	---------	---------	---------	41.00	
----------	1254	---------	---------	---------	---------	41.00	
----------	1255	---------	---------	---------	---------	40.88	
----------	1261	---------	---------	---------	---------	36.31	
----------	1262	---------	---------	---------	---------	44.44	
----------	1464	---------	---------	---------	---------	45.50	
----------	1623	---------	---------	---------	---------	43.87	
----------	1702	---------	---------	---------	---------	42.75	
----------	1703	---------	---------	---------	---------	43.12	
----------	1704	---------	---------	---------	---------	41.56	
----------	1173	24.00	10.62	4.29	3.68	16.00	
----------	1178	27.00	11.11	6.58	3.41	15.75	
----------	1185	26.00	10.41	5.68	4.49	17.13	
----------	1085	---------	---------	5.09	---------	11.96	Poor quality.
----------	1086	---------	---------	5.02	---------	13.78	Below standard.
----------	1204	28.00	---------	---------	---------	15.93	Contains cockle.
----------	1205	28.00	---------	---------	---------	17.62	Contains cockle.
----------	1206	28.00	---------	---------	---------	17.00	Contains cockle.
----------	1207	30.00	---------	---------	---------	17.75	
----------	1259	20.00	---------	---------	---------	14.25	
September 16--	1474	25.00	---------	5.16	2.86	18.56	
----do ----------	1475	22.00	---------	5.74	3.39	16.00	Wheat bran, contains large amount cockle.
----do ----------	1476	24.00	---------	4.52	3.85	17.00	Ship-stuff, good.
----do ----------	1477	20.00	---------	5.33	2.66	13.06	Wheat bran, low grade; contains cockle.
----do ----------	1478	25.00	---------	5.11	2.93	13.38	Wheat bran, low grade; contains cockle.
----do ----------	1479	24.00	---------	5.64	3.45	15.38	Wheat bran.
September 17--	1480	25.00	---------	6.36	3.51	17.31	Wheat bran, contains large amount cockle.
----do ----------	1481	27.00	---------	6.33	3.43	16.38	Wheat bran, contains slight amount cockle.
September 19--	1482	28.00	---------	6.12	3.64	18.13	do.
----do ----------	1483	25.00	---------	6.09	4.14	17.50	Wheat bran, contains cockle.
----do ----------	1484	25.00	---------	7.35	3.19	14.69	Wheat bran, contains cockle, dirty.
----do ----------	1485	25.00	---------	5.57	2.88	13.50	Wheat bran, contains cockle, low grade.
September 20--	1487	25.00	---------	4.48	3.72	15.63	Shorts, good.

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Name of Material.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1488	Bran	Atlanta Milling Co , Atlanta, Ga.	B. W. Upchurch, Raleigh
1489	do	do	J. P. Wyatt & Bros., Raleigh
1490	do	Farina Milling Co., Raleigh, N. C.	Hunter & Dunn, Raleigh
1491	do	, Statesville	Newcomb & Peebles, Raleigh
1492	do	Atlanta Milling Co., Atlanta, Ga.	Phillips & Co., Raleigh
1493	do	N. R. Zimmerman & Co., Elizabeth City, N. C.	N. R. Zimmerman & Co., Elizabeth City.
1494	do	Elizabeth City Milling Co., Elizabeth City, N. C.	Elizabeth City Milling Co., Elizabeth City.
1125	Ship-stuff	J. D. Manor & Co., New Market, Va.	*B. B. Wortham, Cokes
1131	do		*R. H. Jones, Raleigh
1247	do	Dan Valley Mills, Richmond, Va.	Cannon & Fetzer, Concord
1248	do	do	do
1496	do	Dan Valley Mills, Danville, Va.	Tucker & Erwin, Greensboro
1516	Corn and oats	Elizabeth City Milling Co., Elizabeth City, N. C.	Elizabeth City Milling Co., Elizabeth City.
1497	Ship-stuff	Dan Valley Mills, Danville, Va.	Hiatt & Lamb, Greensboro
1498	do	Richmond Flour and Feed Co. (Jobbers), Richmond, Va.	Fletcher & Rhodes, Greensboro
1499	do	Dan Valley Mills, Danville, Va.	S. E. Hudson, Greensboro
1500	do	do	J. R. Foster & Co., Greensboro
1501	do	Liberty Mills, Nashville, Tenn.	C. E. Pugh, Greensboro
1502	do	W. T. Walker, Reidsville, N. C.	do
1503	do		S. O. Bennett, Winston
1504	do	Farina Milling Co., Raleigh, N. C.	J. S. Womble, Raleigh
1505	do		J. P. Wyatt & Bros., Raleigh
1506	do	Dan Valley Mills, Danville, Va.	Hunter & Dunn, Raleigh
1507	do	do	Newcomb & Peebles, Raleigh
1508	do	Richmond Flour and Feed Co. (Jobbers), Richmond, Va.	Phillips & Co., Raleigh
1510	Chops	N. R. Savage & Son, Richmond, Va.	D. M. Miller, Salisbury
1511	do	Salisbury Roller Mills, Salisbury, N. C.	Hall & Griggs, Salisbury
1513	do	Farina Milling Co., Raleigh, N. C.	Hunter & Dunn, Raleigh
1514	do	Phillips & Penny (Jobbers), Raleigh, N. C.	W. R. Dorsett, Raleigh
1495	Shorts	Guilford Roller Mills, Greensboro, N. C.	Tucker & Erwin, Greensboro
1509	do	do	Hiatt & Lamb, Greensboro
1486	Bran and shorts	Mecklenburg Flour Mills, Charlotte, N. C.	McManus, Sharp & Co., Charlotte.
1120	Brewer's sprouts		*Geo. F. Weston, Biltmore
1106	Germ oil meal		do
1120	Brewer's sprouts		do
1121	Dried Brewer's grain.		do

*Samples sent by these parties for examination.

COMMERCIAL STOCK FEEDS—CONTINUED.

Date of Purchase.	Laboratory Number.	Retail Price per Ton.	Water.	Ash.	Ether Extract (Fat or Oil).	Protein.	Microscopic Examination Shows These Materials to be or to Contain—
1901 and 1902.							
September 25	1488	$20.00		10.31	3.19	10.94	Wheat bran, extremely poor quality, 6.2 per ct. gr. white mineral.
----do	1489	23.00		6.81	3.74	16.69	
----do	1490	23.00		5.51	3.78	17.37	Wheat bran, contains large amount cockle.
----do	1491	22.00		5.30	4.02	14.06	Wheat bran, contains very large amount cockle.
----do	1492	22.00		6.93	3.31	15.56	Wheat bran.
September 16	1493			6.67	3.51	16.88	Wheat bran, contains slight amount cockle.
----do	1494			7.00	3.53	16.56	Wheat bran, clean.
August 27	1125		12.90	2.32	2.84	14.88	
	1131			3.09		13.86	
	1247	27.00			5.29	16.81	
	1248	27.00			5.24	17.81	
September 16	1496	26.00	11.97	4.16	4.08	17.31	Wheat bran, contains large amount cockle.
----do	1516			2.13	4.48	10.75	Clean corn and oat chop.
----do	1497	27.00		4.89	4.38	17.62	
----do	1498	27.00		8.91	2.32	9.81	Ship-stuff, low grade; contains 6.8 per cent ground white mineral.
----do	1499	28.00		4.58	4.30	18.00	Contains wheat bran.
----do	1500	27.00		4.49	4.34	17.37	Contains wheat bran, good.
September 17	1501	27.00		4.50	4.96	18.18	
----do	1502	30.00		3.46	3.28	13.12	Shorts.
September 18	1503	25.00		3.21	3.78	17.19	Shorts, good.
September 25	1504	26.00		2.41	3.51	15.38	Ship-stuff, good.
----do	1505	25.00		3.30	3.67	13.12	Ship-stuff.
----do	1506	24.00		4.71	4.31	17.62	Contains wheat bran.
----do	1507	24.00		4.20	3.93	17.19	Contains wheat bran, much cockle.
----do	1508	25.00		3.19	4.21	17.06	Ship-stuff.
September 19	1510	33.00		5.67	2.59	8.06	Corn chops and oat hulls, very poor quality; contains 2.8 pr. ct. insol. mineral.
----do	1511	30.00		3.56	3.89	13.31	Corn and wheat chop mixed with oat hulls.
September 25	1513	24.00		2.16	3.10	15.63	Wheat shorts, contains some cockle
----do	1514	27.00		3.50	5.61	15.50	
September 16	1495	30.00		2.04	2.84	15.31	
----do	1509	29.00		1.73	2.51	16.00	
September 20	1486	25.00		4.69	4.07	17.81	Contains wheat bran and cockle.
August 9	1120					23.69	
	1106		9.33	1.47	15.04	20.94	
	1120		14.52	6.00	1.00	23.69	
August 9	1121		11.14	3.81	5.90	24.94	

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Name of Material.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.
1127	Flour feed	Ballard & Ballard, Louisville, Ky.	*Geo. F. Weston, Biltmore
1132	Oat feed	Richmond Flour and Feed Co., Richmond, Va.	*M. C. Braswell, Battleboro
1137	Dried Brewer's grain.		*Geo. F. Weston, Biltmore
1138	Molasses feed		do
1164	Cotton-seed kernels	Swift Creek Manufacturing Co., Wrendale, N. C.	
1169	Stock food		*J. D. Hodges, Augusta
1177	Rice meal	Carolina Rice Mills, Goldsboro, N. C.	*Best & Thompson, Goldsboro
1181	Mill feed	Lexington Roller Mills Co., Lexington, Ky.	*A. D. Wissell, Wilmington
1186	Cow feed		*J. S. McEachern & Sons, Wilmington.
1214	Daisy Wheat Middlings.		*J. C. Flinn, Pine Hall
1220	Rice meal		*F. E. Smith, Polk
1223	Oat feed	Richmond Flour and Feed Co., Richmond, Va.	*Naomi Falls Store Co., Randleman.
1238	Cooked feed	Harrison Hill Co., Nashville, Tenn.	*Gilbert Lumber Co., Elkin
1249	Dried Brewer's grain.		*Geo F. Weston, Biltmore
1250	do		do
1256	Mixed feed		*Madison Grocery Co., Madison
1512	Corn and oats		*J. P. Wyatt & Bros., Raleigh.
1515	do	N. R. Zimmerman & Co., Elizabeth City, N. C.	*N. R. Zimmerman & Co., Elizabeth City, N. C.

*Samples sent by these parties for examination.

CONDIMENTAL STOCK FOODS AND CONDITION POWDERS.

By Tait Butler and F. C. Lamb.*

The large amount of money expended by the stock-owners of the State for patent stock foods and condition powders renders the fullest information concerning their composition and merits desirable.

If these compounds possess any value it must be as either food or medicine. At one time the manufacturers of many of them made strong claims as to their food value, as indicated by the names they bear—Globe Stock Food, Acme Stock Food, Iowa Stock Food, Pratt's Food, Standard Stock Food, International Stock Food, etc.; but the work of the chemist easily showed their approximate food value, and it accordingly became necessary for the manufacturers to modify their original claims. At present most of them vehemently disclaim any special merit for it as food, but base their claims for patronage on the value of the compound as condiments and medicine. It was too easy

*The analyses were made by Mr. Lamb and the discussion is by Dr. Butler.

COMMERCIAL STOCK FEEDS—CONTINUED.

Date of Purchase.	Laboratory Number.	Retail Price per Ton.	Water.	Ash.	Ether Extract (Fat or Oil).	Protein.	Microscopic Examination Shows These Materials to be or to Contain—
1901 and 1902.							
September 16	1127	$				17.88	
October 24	1132					10.94	Mixed and ground oat hulls and mill sweepings, extremely poor feed.
December 10	1137				15.70	36.81	
----do	1138				9.80	20.31	
	1164					30.38	
	1169					15.00	
February	1177	23.00	9.95	8.09	9.62	12.13	
----do	1181	24.50	10.11	5.56	4.22	16.19	
----do	1186	29.00	10.24	4.60	5.32	17.00	
	1214			4.42		22.68	
	1220					10.50	
	1223	21.90				5.94	Largely oat hulls, value very small.
	1238		8.47	4.80	8.26	12.06	Contained weed seed.
	1249				15.45	40.56	
	1250				11.70	16.18	
	1256		2.70		3.05	9.94	Two-thirds oat hulls, balance being corn meal and wheat bran.
September 25	1512	32.00	11.66	4.24	3.94	9.75	Corn and wheat chop mixed with oat hulls, contains cockle.
September 16	1515		11.79	1.59	4.51	9.44	Corn meal and oat hulls. No oat meal.

for the chemist and feeders to determine their true food value, and it became necessary, in order to maintain their sale, to transfer them to the uncertain and intangible field of medicine. The mystery and popular ignorance concerning medical practice make it a much more secure field in which to exploit fictitious claims. However, owing to the former claims made as to the value of these compounds as food, and the misleading nature of the names which they yet bear, many people still buy them for their supposed food value. Reference to the BULLETIN of this Department (December, 1900), *Bulletin No. 71* of the Massachusetts Experiment Station, *Bulletin No. 132* of the Connecticut Experiment Station, and page 76 of this BULLETIN will show the food value of these substances. It will be seen that they are usually much inferior in food value to cotton-seed meal and other highly concentrated feeding stuffs, and rarely better than corn meal or wheat bran. In fact, many of them consist almost exclusively of corn meal or wheat bran, with the addition of a little salt, pepper and charcoal. All these substances may be beneficial to live-stock, and if purchased at their true value no objection can be raised against them, but when bought as condimental stock foods they cost from $75 to $500 a ton instead of from $15 to $25, their true market price.

As medical or condimental agents, it is claimed that these patent compounds prevent certain diseases, cure a large variety of others and enable the animal to digest more food and make better use of it.

There are two methods of judging of the accuracy of these claims: First, after the chemist and the microscopist have told us the ingredients they contain, the medical man may judge of their value or effect from his knowledge of medical science, and the value of these substances when used in medical practice. Judged on this basis, it will be readily admitted by all competent medical authorities that corn meal, wheat bran, salt, pepper, charcoal, fenugreek, etc., possess no marked medicinal properties for either the prevention or cure of disease. The second method of judging of the value of these condimental stock foods or condition powders is by actual trial or feeding tests. The manufacturers lay great emphasis on the value of testimonials based on what they call actual tests by practical feeders. These tests by so-called practical feeders are usually no tests at all, but merely consist in feeding the mixture to unthrifty animals or to a number of fattening or dairy animals. It is needless to say that because an unthrifty animal improves when receiving these condiments along with other good foods and care, such is no evidence that the condiments are alone or even principally responsible for the improvement. An animal frequently—very frequently—recovers in spite of the treatment it receives.

But, apart from these considerations, it may be stated that no trial is either practical or worthy the name of a test unless the food and the animal are both weighed, and unless another lot of animals of the same quality, age, size and condition and kept and otherwise fed in the same manner are compared with those receiving the condimental foods. Fortunately, several tests of this sort have been made, and while made by what the manufacturers and others sneeringly term theoretical feeders, are the only real practical tests made of the feeding value of these patent foods. Two tests have been made at the Kansas Experiment Station with dairy cows and briefly reported as follows:

FIRST TEST.

On November 1, 1900, sixteen cows from the herd of the Kansas Agricultural College were divided into two lots as nearly equal as possible, on the basis of the yields of milk and butter fat for the month of October. One lot (cows fed Acme food) had the advantage by 212 pounds of milk and 17.4 pounds of butter fat for the month. Both lots were fed on alfalfa hay, with a grain ration of equal parts of corn chop and bran. In addition to this feed, one lot received Acme Stock Food, fed according to directions. On December 1st oats took the place of bran in the grain ration of both lots. The results for the three months (92 days) under experiment are as follows:

Eight Cows receiving Acme Food.		*Eight Cows without Acme Food.*	
Milk produced, pounds	14,271	Milk produced, pounds	14,395
Test, per cent	4.39	Test, per cent	4.13
Butter fat produced, pounds	626.7	Butter fat produced, pounds	595.9
Cost per pound of fat, cents	14.6	Cost per pound of fat, cents	12.3

SECOND TEST.

Taking the record for the month of January as the basis, a herd of twenty cows was divided into two lots as nearly equal as possible, there being only a difference of 1.4 pounds of butter fat in the total yield for the month. All the cows received alfalfa hay for roughness, and equal quantities of corn-and-

cob meal and oats for the grain ration. One lot received the Globe Stock Food in addition. The results for two months (59 days) are as follows:

Ten Cows with Globe Food.		*Ten Cows without Globe Food.*	
Milk produced, pounds	12,784	Milk produced, pounds	12,896
Test, per cent	4.05	Test, per cent	3.96
Butter fat produced, pounds	518.1	Butter fat produced, pounds	511.3
Cost per pound of fat, cents	11.7	Cost per pound of fat, cents	11

The Iowa Experiment Station also made a test of the value of these condimental foods and several well-known concentrated feeding stuffs when added to a corn ration for the fattening of steers.

There were ten lots of 22 steers each, selected so as to make them all as near equal as possible. Of the ten lots, three were fed patent stock foods. The lot showing the lowest net profit as the result of 94 days' feeding had received Standard Stock Food. The lot showing the second lowest net profit had received International Stock Food, and the lot showing the fourth lowest net profit had received Iowa Stock Food. In other words, of the seven lots receiving no condimental food, all of them gave a greater net profit than two out of three of those receiving them, and six out of the seven receiving no condimental food gave a greater net profit than all of those receiving them.

In conclusion, it may be freely stated that the so-called condimental stock foods and condition powders on the market, when tested by accurate and practical feeding trials, when judged as medicines, when compared in price with other materials of the same feeding value, or when measured by the claims made for them by the manufacturers, fail to show merit sufficient to justify their use.

If the live-stock is well and properly cared for and fed, it needs no medicine. If care and feed are needed, the best may be had on any market for less than one-tenth that charged for it when put up in one or two pound packages and advertised as "stock food" or "condition powder."

The question often arises, why is it if these stock foods are all frauds that so many honest and intelligent men think they have obtained good results from their use? The answer is not difficult. There is in every organism an inherent tendency to return to normal conditions, or, in other words, to get well if sick. When a man gets to the point of buying condition powders for an animal he is ready to give him the better care and food which alone would and does bring about the desired improvement in condition. The "stock food" gets the credit, although it does contain nothing but wheat bran, charcoal and pepper and salt. If it is a tonic that the horse, cow or pig is in need of, why not purchase gentian, iron and nux vomica direct from the druggist? They will not only cost less, but, if medicine is really needed, are much more likely to produce the desired effect.

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler from Label or Given by Retailer.	Retail Dealer and Place Purchased.	Date of Purchase.	Retail Price per Package.	Approximate Weight of Pkge.	Retail Price per Ton.
					Cts	Lbs	Dols.
HORSE AND							
1189	International Stock Food.	International Food Co., Minneapolis, Minn.	E. T. Whitehead & Co., Scotland Neck.	1902. Feb. 27	25	2	250.00
1191	Lightning Horse, Cattle and Poultry Powder.	Herb Medicine Co., Springfield, Ohio.	----do----------	--do ---	10	1	200.00
1190	Pratt's Animal Regulator.	----------	----do----------	--do ---	25	1½	333.33
1193	Pratt's Food---------	----------	----do----------	--do ---	75	12½	120.00
1245	Myers Royal Horse and Cattle Spice.	----------	Shuping-Davis Grocery Co., Morganton	--------	----	----	------
1246	Barker's Vegetable Horse, Cattle and Poultry Powder.	Barker, Moore & Mein Medicine Co., Philadelphia, Pa.	R. W. Conswell, Enola	--------	15	----	------
1192	----do ----------	----do ----------	E. T. Whitehead & Co., Scotland Neck.	--------	15	1	300.00
1257	International Stock Food.	International Food Co., Minneapolis, Minn.	M. Huffman, Enola --	--------	----	----	------
1430	American Horse Powder.	American Stock Food Co., Fremont, Ohio.	Jos. Willis, Stoneville	Oct. 1	50	----	------
1431	American Worm Powder for Horses and Cattle.	----do ----------	----do----------	--do ---	50	----	------
POULTRY							
1188	International Poultry Food.	International Food Co., Minneapolis, Minn.	E. T. Whitehead & Co., Scotland Neck.	Feb. 27	25	2	250.00
1465	Eggs-Kum ----------	Reliable Remedy Co., New York, N. Y.	---------- ----	Oct. 3	----	----	------
1466	Banner Egg Food and Tonic----------	Excelsior Wire and Poultry Supply Co., New York, N. Y.	---- ----------	--do ---	25	1	500.00
1467	Milk Albumen-------	National Milk Sugar Co., New York, N. Y.	---------- ------	--do ---	----	----	------
1468	Lee's Egg Maker----	Excelsior Wire and Poultry Supply Co., New York, N. Y.	---------- ----------	--do ---	----	----	------
1469	Pratt's Poultry Food	Pratt Food Co., Philadelphia, Pa.	---------- ------	--do ---	----	----	------
1517	Poultry Food -------	Midland Poultry Food Co., Kansas City, Mo.	F. G. Battle, Durham	Sept. 23	2.25	80	56.25
MISCEL							
1432	American Hog Cholera Cure.	American Stock Food Co., Fremont, Ohio.	Jos. Willis, Stoneville	Oct. 1	2.00	----	------

OF CONDIMENTAL STOCK FOODS.

Laboratory Number.	Water.	Total Ash.	Ash Insoluble in Acid.	Phosphoric Anhydride (P_2O_5).	Iron Oxide (Fe_2O_3).	Calcium Oxide (CaO).	Sulphuric Anhydride (SO_3).	Common Salt (NaCl).	Magnesium Oxide (MgO).	Free Sulphur.	Protein.	Ether Extract.	Microscopic Examination Shows These Materials to be Composed Principally of –
CATTLE FEEDS.													
	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	
1189	9.09	19.56	.31	1.74	.21	.44	.22	14.63	.65	----	14.49	3.55	Wheat bran, linseed meal, charcoal, salt (14.6 per cent), hulls or chaff and asafetida.
1191	11.51	29.42	.62	.56	.32	2.82	7.50	------	5.32	6.99	21.25 †	19.29	Wheat shorts, charcoal, fenugreek, pine rosin, salts, sulphur.
1190	9.15	11.23	.21	.81	.20	.44	.32	8.58	.29	----	16.67	5.57	Corn meal, salt (8.6 per cent), charcoal, fenugreek, gentian.
1193	9.53	6.61	.20	2.01	.07	.22	.13	2.27	.66	----	16.96	7.52	Wheat bran, fenugreek, salt (2.3 per cent).
1245	9.08	23.74	2.05	.86	.51	.94	.65	16.79	.45	----	14.93 †	4.94	Linseed meal, whole wheat, broken corn, malt sprouts, turmeric or mustard, fenugreek, caraway seed, other weed seeds, salt (16.8 per cent).
1246	8.25	13.04	.64	1.43	1.83	1.45	1.24	3.55	.71	1.48	31.56 †	6.12	Linseed meal, wheat products, charcoal, salt (3.5 per cent), saltpeter, sulphur.
1192	10.25	14.87	.63	1.86	2.01	1.62	1.82	4.01	.73	1.13	28.44	5.70	Wheat products, linseed meal, charcoal, sulphur, salt, saltpeter.
1257	9.17	14.31	.38	1.86	.34	.30	.21 *	9.13	.61	----	15.94 †	1.89	Wheat bran, linseed meal, charcoal, salt (9.1 per cent).
1430	11.90	18.11	.45	.74	.48	.25	4.45	------	.29	8.18	23.57	8.93	Linseed meal, fenugreek, saltpeter, sulp. (8.2 per cent), charcoal, pepper, salt.
1431	10.84	20.60	.50	.66	.56	.51	4.62 ‡	------	.23	7.78	22.84 †	10.21	Linseed meal, fenugreek, peppers, saltpeter, sulphur (7.8 per cent), salts.
FOODS.													
1188	10.07	6.90	1.05	1.90	1.64	.32	.42	------	.67	----	28.40	4.75	Wheat bran, red pepper, anise, charcoal.
1465	11.28	11.32	.95	1.85	1.45	1.49	2.31	------	1.43	----	31.91	1.74	Wheat products, linseed meal, salts.
1466	2.30	78.39	3.58	1.99	2.92	46.58	1.50	------	.42	----	6.90	1.94	Oyster shells, bone meal, charcoal, red pepper, fenugreek.
1467	9.40	22.98	.09	7.65	.32	11.74	.96	.55	.25	----	49.14 †	1.67	Casein from milk.
1468	9.18	25.55	.91	.58	.86	.83	1.71	18.38	.18	----	47.09 †	3.24	Resembles dried blood, salt (18.4 per cent).
1469	9.95	6.70	1.39	1.95	1.77	.30	.25	------	.64	.81	17.13	7.62	Corn meal, wheat bran, red pepper and a bitter drug.
1517	7.73	17.29	11.44	1.94	.41	1.19	.37	.87	.45	----	19.00	3.96	Wheat products, charcoal, sand (11.4 per cent).
LANEOUS.													
1432	14.16	23.31	.91	.70	.75	.51	10.00	------	.39	----	15.39	2.76	Wheat products, hyposulphite of sodium, fenugreek, charcoal.

* Contains 5.54 Na_2O, 4.76 K_2O.

† Contained Nitrates.

‡ Contains 5.45 Na_2O, 5.76 K_2O.

THIRD (PARTIAL*) REPORT OF WORK ON THE DEPARTMENT'S TEST FARMS FOR SEASON 1902,

INCLUDING

VARIETY AND DISTANCE TESTS WITH CORN AND COTTON.

BY

B. W. KILGORE, STATE CHEMIST,
C. B. WILLIAMS, ASSISTANT CHEMIST,

AND

R. W. POU, SUPERINTENDENT EDGECOMBE TEST FARM,
J. L. McKINNON, SUPERINTENDENT RED SPRINGS TEST FARM.

On the following pages are recorded the results of this year's work with variety and distance tests of corn and cotton on the Department's Test Farms. These farms are located on the coastal plain formation, which comprises something like forty per cent of the total area of the State.

The testing of these two factors in crop production is of the most fundamental importance. If by carefully conducted experiments through a number of years the most advantageous distancing and most prolific varieties of corn and cotton on the different types of soil for an average season can be ascertained, and farmers generally induced to use the best varieties and distances in growing these crops, material assistance will have been given in increasing the total amounts of these crops grown in the State. Increasing the average yield of corn one bushel and seed cotton fifty pounds per acre will, according to the Census of 1900, increase the annual profits of the farmers of North Carolina by over $2,500,000, allowing fifty cents per bushel for corn and two and one-half cents per pound for seed cotton. This does not appear, with the hearty coöperation of farmers, such a far-distant possibility in the light of results the past three years. This year the difference between the highest and lowest yield of varieties of corn was fifteen bushels, and seed cotton over four hundred pounds per acre on the same land, with identical cultivation and fertilization. It must not be forgotten that the best distancing of any crop is principally dependent upon soil fertility, while yield of a variety is governed largely by the rigidity with which selection of desirable characteristics has been made.

I. VARIETY AND DISTANCE TESTS OF CORN.

Preparation and Cultivation.—The plats were all broken alike with a two-horse turning plow eight to ten inches deep and harrowed. Soon after, the rows were run, 4 to 5 inches deep and 4 feet apart, in variety tests and the several distances in the distance tests.

*The main portion of the work for 1902 is not published, but is reserved for use at the close of another season (1903), when the results of the four years' tests will be brought together, with the view of drawing such conclusions as may be warranted on the subjects covered by the experiments.

The fertilizer materials were applied uniformly in this drill and covered, the application being at the following rate per acre in all tests:

Three hundred pounds of a mixture of acid phosphate, cotton-seed meal and kainit, which contained 7 per cent available phosphoric acid, 1½ per cent potash and 3 per cent nitrogen, and cost $2.53.

The slight ridge formed in covering the fertilizer was opened and the corn planted a little below the level, all tests being given the same treatment as to time of planting and otherwise. All cultivations were level and rather deep early in the season, with the small hoes of the Planet Jr. Cultivator, but became shallower, using the large hoes, as the season advanced and the roots extended towards the middle of the row and near the surface. This afforded pretty thorough breaking of the land early in the season and prevented the disturbance of the root system later. An effort was made to cultivate every ten or twelve days, as far as the weather would permit, and especially immediately after rains, in order to produce a fine dust mulch, with the shallow-running plows, to retard the evaporation of the recently added moisture.

This corn was harvested and shocked on August 23 at the Edgecombe farm, and August 25 and 26 at Red Springs farm, but was not husked until November 10 at former, and about November 15 at the latter.

RESULTS OF VARIETY TEST OF CORN.

The results of this test are contained in the following tables:

TABLE I—RESULT OF VARIETY TEST OF CORN.

EDGECOMBE FARM.

Rank in Order of Productivity of Shelled Corn.	Varieties Tested.	Yield per One-twelfth Acre Plot.		Total Bushels Shelled Corn per Acre.	Number Ears per Bushel Shelled Corn.	Pounds Ears (Grain and Cob) for One Bushel Shelled Corn.	Shelling Capacity.		Total Weight.		Stover per Acre—Pounds.	Percentage Yield of Shelled Corn of Different Varieties Calculated to Basis of Yield of Cocke's Prolific.	Percentage Yield of Stover of Different Varieties Calculated to Basis of Yield of Holt's Strawberry.
		Ears—Pounds.	Nubbins—Pounds.				Grain—Per Cent.	Cobs—Per Cent.	Ears—Per Cent.	Stover—Per Cent.			
1	Cocke's Prolific	176.25	26.00	35.2	162	68.9	81.3	18.7	47.0	53.0	2733.0	100.0	82.8
2	Weekley's Improved	153.50	35.25	33.5	166	67.7	82.7	17.3	54.9	45.1	1875.0	95.2	56.8
3	Craig's Prolific—Strawberry	130.50	75.00	29.1	141	64.6	86.7	13.3	46.7	53.3	2142.0	82.7	64.9
4	Sanders' Improved	125.00	23.00	27.0	162	65.8	85.1	14.9	43.5	56.5	2304.0	76.7	69.8
5	Pool's	147.00	18.00	26.1	142	75.9	73.8	26.2	54.1	45.9	1680.0	74.1	50.9
6	Holt's Strawberry	116.00	29.00	24.9	138	70.0	80.0	20.0	34.5	65.5	3300.0	70.7	100.0
7	Craig's Prolific—White	101.50	28.50	24.6	------	63.3	88.5	11.5	43.6	56.4	2016.0	69.9	61.1
8	Champion White Pearl	107.50	17.25	21.6	------	69.2	80.9	19.1	56.7	43.3	1143.0	61.4	34.6
9	Native	112.50	11.50	21.4	130	69.5	80.6	19.4	46.8	53.2	1692.0	60.8	51.3
10	Cooley's Red Cob	89.00	26.75	20.6	------	67.4	83.1	16.9	44.5	55.5	1731.0	58.5	52.5
11	Brake's	90.75	24.25	20.5	128	67.4	83.1	16.9	41.1	58.9	1980.0	58.2	60.0
12	Improved Leaming	94.75	22.75	20.0	------	70.4	79.6	20.4	41.2	58.8	2010.0	56.8	60.9

TABLE II—COMPILED RESULTS OF VARIETY TESTS OF CORN.

EDGECOMBE FARM.

Varieties Tested.	1900.		1901.		1902.		Averages.	
	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity.
Cocke's Prolific	20.0	2	28.1	2	35.2	1	27.8	1
Weekley's Improved	19.4	3	29.5	1	33.5	2	27.5	2
Pool's					26.1	5		
Craig's Prolific—Strawberry					29.1	3		
Sanders' Improved	17.8	4	27.0	3	27.1	4	24.0	5
Holt's Strawberry	22.4	1	25.7	6	24.9	6	24.3	3
Craig's Prolific—White					24.6	7		
Champion White Pearl					21.6	8		
Cooley's Red Cob	17.2	6			20.6	10	18.9	6
Improved Golden Dent			22.5	7				
Champion Dent			22.2	8				
Hickory King			21.4	9				
Mosby's	17.4	5						
Tatum's Choice	17.0	7						
Shaw's Improved	16.2	8						
Tennessee Yellow			26.6	5				
Native			26.9	4	21.4	9	24.2	4
Improved Leaming					20.0	12		
Brake's					20.5	11		

RED SPRINGS FARM.

Native	22.4	1	14.1	4				
Coman's Best	6.6	2						
Mosby's	15.4	3						
Bradbury's Improved	15.0	4						
Cocke's Prolific	14.4	5	15.3	3			14.9	1
Blount's Prolific	10.2	6						
Improved Golden Dent	10.0	7	14.1	5			12.1	3
Clarke's Mastodon	9.0	8						
Holt's Strawberry	8.4	9	17.3	2			12.9	2
Weekley's Improved			19.0	1				
Sanders' Improved			14.0	6				
Tennessee Yellow			13.5	7				
Hickory King			12.4	8				
Champion Dent			11.3	9				

COMMENTS ON VARIETY TEST OF CORN.

The variety test of corn was conducted this year only at Edgecombe farm, as sufficient desirable space was lacking at Red Springs.

The land was almost perfectly level and uniform in character, and the stand of all varieties was most excellent. The plats were arranged in lateral series, with each variety occupying a plat of one-twelfth of an acre. The varieties are arranged in Table I in the order of productivity. In Table II will be found the compiled results of variety tests at the Edgecombe farm during 1900, 1901 and 1902, and at Red Springs during 1900 and 1901.

SOME NOTES ON VARIETIES OF CORN TESTED IN 1902.

Cocke's Prolific ranked second in 1900, second in 1901, and first in 1902 in bushels of shelled corn per acre at the Edgecombe farm, while at Red Springs it stood fifth in 1900, and third in 1901. The results of the tests of the past three years at the two farms indicate this to be a most substantial and reliable variety.

Weekley's Improved and *Cocke's Prolific* are undoubtedly the two best varieties thus far tested. Their average yield in 1902 was thirteen bushels of shelled corn more than native corn on the same land with identical cultivation. The former variety is a tolerably early one and can be grown with more safety than most of the others, when only a short growing period is afforded. At the Edgecombe farm it ranked in 1900 as third, in 1901 as first, and in 1902 a close second, while at Red Springs in 1901 it stood first. It has a little smaller ear and cob than *Cocke's Prolific.*

Craig's Prolific-Strawberry stood third in 1902 at the Edgecombe farm in the only test in which it has been included. It has a larger ear and smaller cob than *Weekley's Improved.* This gives promise of becoming a very valuable variety.

Sanders' Improved ranked fourth in 1900, third in 1901, and fourth in 1902 at the Edgecombe farm, and sixth in 1901 at Red Springs. This contains an ear about the size of *Cocke's Prolific*, but a smaller cob by almost four per cent.

Pool's has only been tested one year (1902), and it stood fifth place. It has an ear about the size of *Craig's Prolific-Strawberry*, but a much larger cob by about 13 per cent.

Holt's Strawberry occupied first place in 1900, sixth place in 1901 and 1902 at the Edgecombe farm, and ninth place in 1900, and second in 1901 at Red Springs. It has a much larger ear than *Cocke's Prolific*, and a very slightly larger cob. This variety contained a larger proportion of stalk than any other variety tested.

Craig's Prolific-White ranked seventh in 1902 at the Edgecombe farm. It has a smaller cob than any of the other varieties tested, and yielded only about 70 per cent as much as *Cocke's Prolific.*

Champion White Pearl stood, as the result of one year's test in Edgecombe, eighth place. It has a cob a little larger than *Cocke's Prolific*, and produced about 61 per cent of yield of the same. This variety has a smaller stalk than any other variety tested.

Native ranked fourth in 1901 and ninth in 1902 in Edgecombe, and first in 1900 and fourth in 1901 at Red Springs. It will be noticed that this has a large ear and cob, but only yielded about 61 per cent of *Cocke's Prolific*.

Cooley's Red Cob occupied sixth place in 1900 and tenth place in 1902 at the Edgecombe farm. This had a cob about the size of *Weekley's Improved*, but produced only about 61 per cent as much shelled corn.

Brake's, as a result of one year's test in Edgecombe, the home of the variety, ranked eleventh. It had the same size cob and productivity of shelled corn as *Cooley's Red Cob*. Its ear is about the size of *Native* corn.

Improved Leaming ranked in last year's test in the twelfth place. It is a yellow corn, with cob a little larger than *Champion White Pearl*, and produced about 57 per cent of the yield of *Cocke's Prolific*.

SELECTED SEED AND VARIETIES.

Seed-corn should be selected in the field, giving careful consideration to total yield, size of ear and cob, root and leaf development, filling out of tips and butts of ears, rigidity with which the cob holds its grains, size of stalk, germinating power of kernels, etc., as well as power to withstand drought, disease and insect ravages.

With varieties of corn, selection should be made particularly with reference to total yield of shelled corn and the purpose for which the grain is grown. If it is to be used in feeding growing animals, or to be ground into meal for human consumption, it should be high in flesh and muscle-forming material (protein); if for fattening stock, high in fat; and if to manufacture whiskey, alcohol or starch, high in starch, sugar, etc. (carbohydrates).

SOURCES OF VARIETIES TESTED IN 1902.

The varieties of corn used in preceding test at the Edgecombe farm were obtained from the following sources:

Cocke's Prolific.....Edgecombe Test Farm, Rocky Mount, N. C.
Weekley's Improved.....J. F. Weekley, Ulmers, S. C.
Craig's Prolific-Strawberry.....W. R. Craig, Waxhaw, N. C.
Craig's Prolific-White.....W. R. Craig, Waxhaw, N. C.
Sanders' Improved.....W. S. Sanders, Danielsville, Ga.
Pool's.....J. L. Pool, Marion, N. C.
Holt's Strawberry.....Edgecombe Test Farm, Rocky Mount, N. C.
Champion White Pearl.....J. C. Suffern, Voorhies, Ill.
Native.....N. B. Killebrew, Rocky Mount, N. C.
Cooley's Red Cob.....Edgecombe Test Farm, Rocky Mount, N. C.
Brake's.....J. L. Brake, Rocky Mount, N. C.
Improved Leaming.....J. C. Suffern, Voorhies, Ill.

DISTANCE TESTS OF CORN.

(Variety: Cocke's Prolific).

The results of the distance test of corn are included in Tables III and IV, which follow:

TABLE III—RESULT OF DISTANGE TESTS OF CORN.

EDGECOMBE FARM.

Size of Plats in Acre.	Distance Between Rows.	Distance Between Stalks in Rows.	Yield per Acre—Pounds.				Total Bushels Shelled Corn per Acre.	Number Stalks for Perfect Stand per Acre.	Actual Number Stalks per Acre.	Lbs. Shelled Corn per Stalk.	Corrected Yield Shelled Corn in Bushels per Acre.
			Ears.	Nubbins.	Total Corn on Cob.	Stover.					
.2389	Three and one-half feet	Four feet	883.2	125.6	1008.8	1335.2	14.6	3,111	3,122	.233	14.6
.2389	Three and one-half feet	Three and one-half feet	927.2	148.7	1075.9	1477.6	15.6	3,555	3,444	.254	16.1
.2389	Three and one-half feet	Three feet	1000.4	144.4	1144.8	1157.4	16.6	4,148	3,394	.283	18.8
.3640	Four feet	Four feet	1033.0	111.3	1144.3	1397.0	16.6	2,722	2,862	.325	16.2
.2730	Four feet	Three feet	910.3	126.4	1036.7	1732.6	15.0	3,630	3,165	.266	16.1
.2730	Four feet	Two and one-half feet	940.5	157.5	1098.0	1118.1	15.9	4,356	3,594	.249	17.6
.4550	Five feet	Four feet	844.5	123.1	967.6	1027.4	14.0	1,633	1,675	.470	13.6
.3413	Five feet	Three feet	827.7	130.4	958.1	1065.0	13.9	2,903	2,567	.303	13.0

RED SPRINGS FARM.

.2615	Three and one-half feet	Three and one-half feet	596.6	401.5	998.1	1001.9	14.5	3,549	3,442	.290	14.8
.2983	Four feet	Two feet	398.9	415.7	814.6	1076.1	11.8	5,444	5,347	.152	11.9
.2983	Four feet	Three feet	603.4	368.8	972.2	1009.1	14.1	3,631	3,527	.276	14.4
.2983	Four feet	Four feet	502.8	274.9	777.7	864.9	11.3	2,722	2,662	.292	11.4
.3729	Five feet	Two feet	466.6	364.7	831.3	882.3	12.1	4,355	4,291	.194	12.2
.3729	Five feet	Three feet	525.6	238.7	764.3	799.1	11.1	2,904	2,816	.271	11.3
.3729	Five feet	Four feet	520.2	222.6	742.8	710.6	10.8	2,178	2,135	.348	10.9

TABLE IV—COMPILED RESULTS OF DISTANCE TESTS OF CORN.

Variety: Cocke's Prolific.

EDGECOMBE FARM.

Year.	Yield of Shelled Corn in Bushels Per Acre at Different Distancing.										
	3½ feet by 3 feet.	3½ feet by 3½ feet.	3½ feet by 4 feet.	4 feet by 2 feet.	4 feet by 2½ feet.	4 feet by 3 feet.	4 feet by 3½ feet.	4 feet by 4 feet.	5 feet by 2 feet.	5 feet by 3 feet.	5 feet by 4 feet.
1901	--------	--------	--------	28.6	--------	28.4	--------	24.4	22.5	24.3	23.0
1902	18.8	16.0	14.6	--------	17.6	16.1	--------	16.2	--------	13.0	13.6

RED SPRINGS FARM.

1901	--------	9.2	--------	10.0	--------	10.7	--------	16.2	20.0	17.9	18.3
1902	--------	14.8	--------	11.9	--------	14.4	--------	11.4	12.2	11.3	0.9

COMMENTS ON DISTANCE TESTS.

These tests were conducted at both the farms. The distancing that produced the best results at the Edgecombe farm was 3½ by 3 feet, while at Red Springs it was 3½ by 3½ feet. It will require a number of repetitions of this test to arrive at a fair idea of the best width of rows and distance in rows for planting corn on the types of soil used in the experiments. This will no doubt vary with the different kinds of corn, soil and season.

The "corrected yield" in Table III is figured out by applying the correction used by the Georgia Experiment Station, Bul. 41, pages 192-194, which is as follows:

"In the absence of any known rule of adjustment, the total number of plants required for a perfect stand, less one-half the number of missing plants." The author states that while this rule is arbitrary and not the result of actual experiment, it is thought to apply with approximate justice to all varieties, except in the case of abnormally poor stands.

In Table IV is presented in concise form the results of distance tests with corn at the two farms during the past two years. With the exception of the results at Red Springs in 1901, the results seem to point to the best distancing as lying somewhere between 3½ by 3 and 4 by 3-foot rows.

II.—VARIETY AND DISTANCE TESTS OF COTTON.

Preparation and Cultivation.—All plats were broke the latter part of March, seven to ten inches deep, with a two-horse turning plow, and harrowed smooth. About the middle of April rows were run five to seven inches deep, with 8-inch shovel, and the fertilizer materials applied in the drill at the following rate per acre in all tests:

Four hundred pounds of a mixture of acid phosphate, cotton-seed meal and kainit, which contained 7 per cent available phosphoric acid, 2½ per cent potash and 2½ per cent nitrogen, and cost $3.28.

The cultivation was level with cultivators, being moderately deep at the beginning of the season and shallower as the root zone increased. The cultivator was never run more than twice to the row at a time, as this more than covered the middle, and an effort was made to work over the plats as quickly as possible immediately after rains, to break the crust formed by the showers, and leave a dust mulch to check evaporation. The cultivator was run about 1½ to 2 inches deep toward the close of the season. It was attempted to cultivate every ten days, which had to be changed, of course, to suit the seasons.

RESULTS OF VARIETY TEST OF COTTON.

The results of these tests are included in the following tables:

TABLE V—RESULTS OF VARIETY TEST OF COTTON.

EDGECOMBE FARM.

Size of Plats in Acre.	Varieties Tested.	Number Stalks for Perfect Stand Per Acre.	Actual Number Stalks Per Acre.	Yield of Seed Cotton Per Acre at the Several Pickings.				Total Seed Cotton Per Acre.	No. Bolls Required to Yield One Pound of Seed Cotton.	Number Seed in One Pound of Seed Cotton.	Pounds of Lint in 100 Pounds of Seed Cotton.	Pounds of Seed in 100 Pounds of Seed Cotton.	Pounds of Lint Per Acre.	Pounds of Seed Per Acre.	Average Height of Stalks at Maturity in Inches.	Value of Lint at 8 Cents Per Pound.	Value of Seed at 80 Cents Per 100 lbs. = 24 Cents Per Bushel.	Total Value of Seed and Lint Per Acre.
				First Picking Nov. 18.	Second Picking Nov. 18.	Third Picking.	Fourth Picking.											
.1000	Russell's Big Boll	9,960	8,960	*1035.00	640.00	------	------	1675.00	56	2,192	32.39	67.61	543.53	1132.47	------	$43.40	$9.06	$52.46
.0333	Peterkin's Improved	9,960	9,870	1372.50	------	------	------	1372.50	85	3,261	39.10	60.90	536.65	835.85	------	42.93	6.69	49.62
.0333	Truitt's Improved	9,960	7,770	1385.00	------	------	------	1335.00	79	2,585	34.73	65.27	463.65	871.35	------	37.09	6.97	44.06
.0333	Culpepper's Improved	9,960	8,370	1230.00	------	------	------	1230.00	55	2,028	34.62	65.38	425.83	804.17	------	34.07	6.43	40.50
.0333	Daughtridge's	9,960	8,760	1230.00	------	------	------	1230.00	96	3,055	35.70	64.30	439.11	790.89	------	35.13	6.33	41.46
.0333	Blue Ribbon	9,960	9,630	1170.00	------	------	------	1170.00	103	3,312	31.45	68.55	367.97	802.04	------	29.44	6.42	35.86
.0333	King's Early Improved	9,960	4,170	885.00	------	------	------	885.00	86	2,867	36.60	63.40	323.91	561.09	------	25.91	4.49	30.40

RED SPRINGS FARM.

				Sept. 2	Sept. 16	Oct. 21	Dec. 15											
.1000	Culpepper's Improved	10,440	10,170	526.67	331.25	355.35	6.25	1218.52	75	1,940	37.50	62.50	456.98	761.62	28	36.56	6.09	42.65
.0250	Russell's Big Boll	10,440	10,000	290.00	445.00	330.00	5.00	1070.00	70	1,860	34.38	65.62	367.87	702.13	27	29.43	5.62	35.05
.0250	Peterkin's Improved	10,440	9,800	250.00	520.00	205.00	7.50	982.50	100	3,100	40.63	59.37	399.15	583.25	23	31.93	4.67	36.60
.0250	King's Early Improved	10,440	9,920	440.00	330.00	135.00	5.00	910.00	100	1,960	39.06	60.94	355.45	554.55	23	28.44	4.44	32.88
.0250	Excelsior Prolific	10,440	9,840	390.00	365.00	130.00	10.00	895.00	120	2,340	37.50	62.50	335.70	559.50	21	26.86	4.48	31.34

* First picking, October 20.

TABLE VI—COMPILED RESULTS OF VARIETY TESTS OF COTTON.

EDGECOMBE FARM.

Varieties Tested.	1900.		1901.		1902.	
	Yield in Pounds Seed Cotton Per Acre.	Rank in Productivity.	Yield in Pounds Seed Cotton Per Acre.	Rank in Productivity.	Yield in Pounds Seed Cotton Per Acre.	Rank in Productivity.
Russell's Big Boll	1265.0	2	1487.0	1	1675.0	1
Culpepper's Improved	1125.6	4	1302.0	2	1230.0	4
Moss's Improved	1305.0	1	999.0	6		
Breeden's Prolific	1205.0	3				
Todd's Improved	1000.0	5				
Strickland's Improved	950.0	6	1142.0	4		
Lewis' Prize	770.0	7				
Hawkins' Prolific	740.0	8	1053.0	5		
Peterkin's Improved			1215.0	3	1372.5	2
Griffin's Improved			957.0	7		
Truitt's Improved					1335.0	3
Daughtridge's					1230.0	4
Blue Ribbon					1170.0	5
King's Early Improved					885.0*	

RED SPRINGS FARM.

Russell's Big Boll	675.0	2	496.3	1	1070.0	2
Culpepper's Improved	734.4	1	477.0	2	1218.5	1
Peterkin's Improved	660.0	3	440.0	5	982.5	3
Doughty's Excelsior	655.0	4				
Allen's Long Staple	635.0	5				
Moore's Excelsior	635.0	5				
Texas Burr	630.0	6				
Groveton	605.0	7				
Native	530.0	8				
Griffin's Improved			473.1	3		
Hawkins' Prolific			448.3	4		
Moss's Improved			417.0	6		
Sea Island			255.0	7		
King's Early Improved					910.0	4
Excelsior Prolific					895.0	5

* This yield of King's Early Improved should not be included in the comparisons, as the stand was very poor.

COMMENTS ON VARIETY TEST OF COTTON.

The varieties tested at each farm are arranged in the order of their productivity of seed cotton, but which may not be the order of the selling price of total products (lint and seed), as is well shown by *Peterkin's Improved* at Red Springs, which stands third in seed cotton production, but second in value, due to the high percentage yield of lint.

The size of the plats used for this test at the Edgecombe and Red Springs farms were one-thirtieth and one-fortieth acre, respectively, except the first one at each place, which was one-tenth of an acre. All plats were arranged in lateral series, with rows 3½ feet apart in Edgecombe and 3⅓ feet at Red Springs, and 15 inches between hills at both.

It might be stated here that the small yield of *King's Early Improved* at the Edgecombe farm was due to an exceedingly poor stand, which, in turn, was probably due to low vitality of seed, as the soil, preparation and cultivation were identical for all varieties. It is absolutely essential, in order to eliminate soil and weather conditions as much as possible, to continue work of this kind for some years on different soils, before attempting to draw conclusions.

The yields for this year are in Table V, while a résumé of the results obtained during the past three years at the two farms are presented in Table VI.

SOME NOTES ON VARIETIES OF COTTON TESTED IN 1902.

Russell's Big Boll is a large bolled and vigorous growing variety that yields well and is very popular with pickers. In yield of seed cotton, it stood second in 1900, first in 1901 and 1902 at the Edgecombe farm, and second in 1900, first in 1901, and second in 1902 at Red Springs. It seems not only to be one of the most prolific varieties, but also safe and reliable under varying meteorological conditions of the soil and atmosphere. It is medium in date of opening.

Culpepper's Improved, too, is a large bolled variety, yielding generally about the same per boll as *Russell's Big Boll.* It ranked fourth in 1900, second in 1901, and fourth in 1902 at the Edgecombe farm, and first in 1900, second in 1901 and first in 1902 at Red Springs. This variety is earlier and seems to be more subject to variation than *Russell's Big Boll*, but notwithstanding this last defect, is considered a good, reliable variety.

Peterkin's Improved is a very popular variety on account of its high percentage yield of lint, in fact the highest of all varieties tested thus far. It has a compact bushy growth with small bolls which make it difficult and tedious to gather, and hence is very unpopular with pickers. About one-third of the seed are naked. In yield it stood third in 1901 and second in 1902 at the Edgecombe farm, and third in 1900, fifth in 1901 and third in 1902 at Red Springs.

Truitt's Improved occupied third place in the list of 1902 at the Edgecombe farm. It is a tolerably small bolled variety that yielded a high percentage of lint.

Daughtridge's ranked fourth in yield of seed cotton in the test of 1902 in Edgecombe. This variety is even smaller bolled than *Peterkin's Improved*, and produces a high yield of lint.

Blue Ribbon, as a result of one year's test at the Edgecombe farm, stood in sixth place. Its percentage yield of lint was smaller than *Daughtridge's*, as also was the size of its bolls.

King's Early Improved has a boll about the size of *Peterkin's Improved*, but does not yield quite as high per cent of lint. This variety occupied fourth place at Red Springs in 1902.

Excelsior Prolific bears an exceeding small boll, much smaller than *Peterkin's Improved*, and produces a higher percentage yield of lint. In production of seed cotton at Red Springs during this year, this variety ranked fifth.

SELECTING SEED AND VARIETIES.

The seed should, by all means, be selected from plants in the field, having especial reference to total yield of seed cotton, percentage yield of lint, date of maturity, vigor, hardiness, form, size of leaves, stalks and limbs, etc., as well as power to transmit these characteristics persistently and undiminished. Above all things the practice of selecting seed at random at the gin should not be followed.

In selecting variety, one must not be guided entirely by total yield of seed cotton, as often between two varieties producing about the same yield, the one with the smaller yield should be chosen because of its greater production of lint, which sells for from eight to twelve times as much per pound as seed.

SOURCES OF VARIETIES OF COTTON TESTED IN 1902.

The seed used in the variety test of cotton at the two farms were obtained from the following sources:

EDGECOMBE FARM.

Culpepper's Improved.....Edgecombe Test Farm, Rocky Mount, N. C.
Peterkin's Improved.....J. A. Peterkin, Fort Motte, S. C.
King's Early Improved.....Alexander Seed Co., Augusta, Ga.
Blue Ribbon.....J. S. Newman, Clemson, S. C.
Daughtridge's.....E. L. Daughtridge, Rocky Mount, N. C.
Truitt's Improved.....Alexander Seed Co., Augusta, Ga.
Russell's Big Boll.....Edgecombe Test Farm, Rocky Mount, N. C.

RED SPRINGS FARM.

Russell's Big Boll.....Edgecombe Test Farm, Rocky Mount, N. C.
Peterkin.....J. A. Peterkin, Fort Motte, S. C.
King's Early Improved.....Alexander Seed Co., Augusta, Ga.
Excelsior Prolific.....Excelsior Seed Farm, Bennettsville, S. C.
Culpepper's Improved.....Red Springs Farm, Red Springs, N. C.

RESULTS OF DISTANCE TESTS OF COTTON.

(*Variety: Culpepper's Improved*).

These results are found in the tables below:

TABLE VII—RESULTS OF DISTANCE TESTS OF COTTON.

RED SPRINGS FARM.

Size of Plats in Acre.	Distance Between Rows.	Distance Between Hills.	No. Stalks for Perfect Stand Per Acre.	Actual No. Stalks Per Acre.	Yield Seed Cotton in Pounds.	
					Per Plat.	Per Acre.
.1740	Three and one-half feet	Twelve inches	12,448	12,069	219.00	1258.62
.1740	Three and one-half feet	Sixteen inches	9,333	9,161	218.00	1310.34
.1740	Three and one-half feet	Twenty inches	7,466	7,241	233.25	1300.52
.1740	Three and one-half feet	Twenty-four inches	6,224	5,902	248.63	1428.91
.1989	Four feet	Twelve inches	10,890	10,598	244.50	1229.26
.1989	Four feet	Sixteen inches	8,165	8,034	229.38	1153.24
.1989	Four feet	Twenty inches	6,531	6,300	209.13	1051.43
.1989	Four feet	Twenty-four inches	5,445	5,204	231.88	1165.81

TABLE VIII—COMPILED RESULTS OF DISTANCE TESTS OF COTTON.

EDGECOMBE FARM.

Year.	Yield Seed Cotton in Pounds Per Acre at Different Distancing.							
	Three and One-half Feet by 12 Inches.	Three and One-half Feet by 16 Inches.	Three and One-half Feet by 20 Inches.	Three and One-half Feet by 24 Inches.	Four Feet by 12 Inches.	Four Feet by 16 Inches.	Four Feet by 20 Inches.	Four Feet by 24 Inches.
1901	1286.0	1384.0	1410.0	1063.0	964.0	----------	893.0	----------

RED SPRINGS FARM.

1901	284.0	288.0	359.0	447.8	566.9	634.7	----------	----------
1902	1258.6	1310.3	1340.5	1428.9	1229.3	1153.2	1051.4	1165.8

COMMENTS ON DISTANCE TEST OF COTTON.

This test was only conducted at Red Springs this year and the detailed arrangement of plats with results are shown in Table V. The largest yield was from the plat on which cotton stood approximately 3½ feet by 24 inches, while the lowest was from a 4 feet by 20 inches distancing. Here as with other tests it will require a number of repetitions to arrive at a fair idea of the best width of rows and distance in rows for planting cotton on the type of soil on which this test was made.

As the results in this test are likely to vary somewhat with different varieties, one variety each is to be used at the two farms—*Culpepper's Improved* at Red Springs and *Russell's Big Boll* in Edgecombe. In Table VIII is presented a summary of one year's results in Edgecombe and two years at Red Springs.

III. THE INSPECTION OF COTTON-SEED MEAL.

In some parts of the State a misunderstanding exists, or perhaps, rather, a lack of understanding, in regard to the inspection tax on cotton-seed meal. The authority of the Board of Agriculture in levying the tax, its object and its advantage to the purchaser and consumer of the meal have all not been understood.

It has been reported that in one or two localities lawyers have advised the farmers that the tax was illegal and could not be enforced; and it is said that one or two mills have disregarded the tax requirement on the same ground.

Now for some explanation on the whole matter.

As to the authority of the Board of Agriculture: the law governing the inspection, analysis of and traffic in fertilizers says:

SECTION 5. "For the purpose of defraying expenses connected with the inspection of fertilizers and fertilizing materials in this State, there shall be a charge of twenty cents per ton on such fertilizers and fertilizing material, except that which is sold to a manufacturer of fertilizers, for each fiscal year ending November 30th, which shall be paid before delivery to agents, dealers or consumers in this State: *Provided*, that the Commissioner with the advice and consent of the Board shall have discretion to exempt such natural material as may be deemed expedient."

For some reason or other cotton-seed meal had always in the past been exempted under the above proviso; perhaps, because of the difficulty of discriminating between the meal to be used as feed; perhaps, because the price of meal was comparatively low and the same inducements to adulterate it did not exist; perhaps, because the cotton-seed millers were more honest than some of the fertilizer manufacturers were supposed to be; perhaps, for all of these reasons. At any rate the tax had never been imposed.

But times changed.

A year and more ago it became apparent to the Board of Agriculture that the meal on the market was becoming foully adulterated, both for fertilizers and feed. Most of this adulteration, I am happy to believe, came from without the State. It became absolutely necessary, in order to protect the farmers and farm animals, to withdraw the exemption, which had existed, and to subject cotton-seed meal, used as fertilizers, to the same requirements of all other fertilizers, and, used as feed, to the requirements of the Pure Food Law. This latter it is unnecessary to discuss here. The Board of Agriculture did not create the law, but simply exercised a discretion which has always existed in the law. There can be no reasonable doubt of the legality of their action. At the December meeting of the Board in 1901, the exemption was withdrawn and cotton-seed meal was subjected to the inspection tax, and to all the regulations governing fertilizers.

The object of the Board's action was not to obtain revenue—in that view it might not have been legal—but was solely for the protection of the users of meal from being defrauded. The law applies, and the reasons for it exist, just the same to meal which the farmer gets at the mill in exchange for his seed as to the meal he purchases on the market, whether ground in North Carolina or Georgia or elsewhere.

After the foregoing explanation of the origin and authority of the law and of its objects it would seem hardly necessary to dwell upon its advantages. These are too self-evident. All farmers feel the need of protection against fraudulent fertilizers. They feel their utter helplessness to judge for themselves of the quality of the fertilizers they buy. The same reasoning applies to cotton-seed meal. The meal may be so adulterated as to cheat the purchaser out of several dollars per ton, and yet he is not able by ordinary methods to detect the fraud.

Every unit of percentage in the quality of meal means, when the price is $25 per ton, and 8 per cent of ammonia the basis, about $3.12. When, therefore, 8 per cent of ammonia is taken as the standard, and $25 the price per ton, a guaranty of 7½ per cent ammonia ought to reduce the price to $23.44 per ton, and a guaranty of only 7 per cent ammonia ought to reduce the price to $21.88 per ton. On the other hand, meal containing 8½ per cent of ammonia would be worth $26.56 per ton, and 9 per cent, $28.12 per ton.

There are other ingredients in the meal but of comparatively so small value as not to materially affect these estimates.

These valuations will show to the farmers more clearly than probably a majority of them have ever before realized how very important becomes the true branding of the bag and the inspection and analysis of the meal by the chemists of this Department.

The same chemical ingredients which give cotton-seed meal its value as a fertilizer give its value also as food. It is therefore affected as much in the

one case as in the other by adulterations, or by the difference of guaranteed percentages as explained above.

The law requires that all cotton-seed meal offered for sale as a fertilizer shall have branded on bag, or on tag attached thereto, the following data:

1. Cotton-seed meal.
2. Weight of package (usually in 100-lb. bags).
3. Ammonia (or nitrogen) .... per cent.
4. Name and address of manufacturer.

The requirements for meal used for feed are much the same; but these will be more fully considered hereafter, as bills have been introduced into the Legislature which may effect changes in food meal, and indeed also in the meal for fertilizing purposes.

Now let me urge the farmers to rally to the support of the law, because it is for their benefit. The inspectors will go to the towns and depots and will take samples and keep a sharp lookout for infractions of the law, but they cannot be at all places all the time. The farmers themselves can help wonderfully by helping and encouraging the inspectors, and by notifying the Department of Agriculture of any evident and palpable efforts to palm on them inferior stuff, or in any way to evade the provisions of the law.

CANNING, PRESERVING AND EVAPORATING FRUITS AND VEGETABLES.

By Gerald McCarthy,

Botanist and Biologist, Department of Agriculture.

The art of preserving foodstuffs in air-tight vessels was invented by a French cook, Appert, in 1810. His culinary experience had taught him the great value of such a process.

The rationale of the canning process is based on the principle that fermentation is due to living organisms—bacteria and molds. If we heat food in a vessel closed from the air we kill the fermentative germs within, and no more can get in so long as the package remains air-tight; thus fermentation is for the time being prevented and the food keeps indefinitely. Some germs are difficult to kill in the spore stage. These require to be heated to not less than 240 degrees F. for one time, or 212 degrees F. for three successive times. All the common berry fruits, peaches, apples and tomatoes are successfully sterilized in tin cans by one heating or "process" at 212 degrees F. But green peas, corn, beans, okra and potatoes and all animal products require 240 degrees F. to insure safe-keeping. The use of temperatures above 212 degrees F. requires a strong closed kettle or retort. Of late years chemical manufacturers have been urging canners to use salicylic acid, borax and other poisonous chemicals sold under fancy and misleading names for preventing fermentation in canned foods. These poisons are always harmful. Their use in canned food is wholly unnecessary, and in North Carolina such use is even illegal. The uncontrolled use of antiseptics in food is always dangerous to health. Cleanliness, proper attention to sealing the cans and exposure to sufficient heat will preserve canned foods without the addition of any chemicals whatsoever. Not even sugar is essential to preservation of properly canned food.

In practical canning it is found that the open-kettle process, which cannot give a temperature above 212 degrees F., is the easiest to manage and turns out the best quality of goods. But the closed-kettle process, which will give any desired temperature, is more rapid and certain in its results. When quantity is of more importance than quality the closed kettle is preferred. In practically all large commercial canneries the heat is applied by means of steam. The usual plan is to have a coil of perforated steam-pipe in bottom of the kettle or tank. Still many old-fashioned canning houses and small farm canneries use heavy iron kettles set in brick and heated directly by coal or wood fire. The furnace process and outfit is much cheaper than the steam-heat outfit. We recommend steam heat and open-kettle process for berries, fruits and tomatoes. All other vegetables, as well as meats and fish, require the closed-kettle process.

The canning industry in the United States has increased year by year. The census of 1889 showed the annual output to be 600,000,000 cans, worth about $48,000,000. About 1,000,000 persons were employed in handling the goods and 1,500,000 acres of land in growing the raw material. Since 1889 the canning industry has increased at least 50 per cent.

The following estimates on canning machinery and outfits are furnished us by a large manufacturer of such goods:

ESTIMATE NO. 1.—TOMATO AND FRUIT CANNING PLANT. CAPACITY 3,000 3-LB. CANS, OR 5,000 2-LB. CANS PER DAY. KETTLES CAN BE SET IN BRICK-WORK OR ATTACHED TO A STEAM BOILER.

Process Kettle, 36 in. dia. x 36 in. deep	$ 18.00
Exhaust Kettle, 36 in. dia. x 24 in. deep	16.00
Scalding Kettle, 30 in. dia. x 24 in. deep	14.00
3 Sets Grate Bars, 3 Furnace Doors, } or 3 Steam Coils if Boiler is used	15.00
2 Gasoline Fire-pots, complete	32.00
2 6-Tier Process Crates	14.00
2 1-Tier Exhaust Crates	7.00
1 Set of Crane Fixtures	10.00
4 Capping Machines	3.00
4 Capping Coppers	4.00
2 Tipping Coppers	1.00
2 Scalding Baskets	2.00
1 Forging Handle	.25
1 Forging Stake	2.50
1 Vise	2.50
¼ Doz. Files	1.35
2 Prs. Can Tongs	.70
1 Forging Hammer	1.00
1 Floor Truck	12.00
2 Doz. Peeling Knives	2.00
	$158.30

Estimate does not include steam boiler.

A 20-horse-power boiler would be suitable for the purpose. A building 20 x 45 feet would be a very suitable one for this plant. Boiler may be placed in this building or in a boiler-room adjoining.

ESTIMATE NO. 3.—FOR CANNING ALL GOODS HERMETICALLY SEALED, SUCH AS FRUITS, VEGETABLES, OYSTERS, FISH, ETC. CAPACITY 15,000 TO 20,000 CANS PER DAY.

A 35-horse-power steam boiler and a building 25 feet x 75 feet, with shed attached, would be suitable for this plant. Outfit as follows:

1 Closed-top Steam Kettle, 40 in. x 60 in.	$125.00
1 40-in. x 60-in. Open-process Kettle	32.00
12 Process Crates	78.00
1 Exhaust Tank Cage and Steam Cross	30.00
1 Tomato Scalder Tank, Cage, Steam Cross, Rope and Blocks	30.00
8 Gasoline Fire-pots, complete	92.00
1 No. 1 Crane Fixture	10.00
1 No. 2 Crane Fixture	12.00

12 Capping Handles	$ 9.00
12 Capping Coppers	12.00
6 Tipping Coppers	3.00
2 Forging Handles	.50
1 Forging Stake	2.50
1 Forging Hammer	1.00
1 Vise	6.00
2 Floor Trucks	24.00
2 Pairs Can Tongs	.70
½ Doz. Files	2.70
4 Buckets for Tomato Scalder	8.00
6 Doz. Peeling Knives	6.00
	$484.40

This estimate does not include cost of steam boiler or necessary fittings. These will cost about $200.

Miscellaneous Supplies for Canneries.

Acid, per carboy ($1.50 allowed for empties), 100 lbs	$ 4.50
Air Gauges	3.00
Air Pump, Hand	7.00
Air Pump, Lever	12.00
Air Pump, Wheel	35.00
Chloride of Calcium, per lb	.02½
Coppers, Capping, Tipping, per lb	.25
Coppers, 4-lb. Tipping, per pair	1.00
Coppers, 8-lb. Capping, per pair	2.00
Cap Weights	.25
Capping Machines, Tillery's	.75
Capping Machines, Debow's	1.00
Capping Machines, Brace	.75
Coils for Steam Kettles, 30 in. diameter	1.50
Coils for Steam Kettles, 36 in. diameter	2.00
Coils for steam Kettles, 40 in. diameter	2.50
Coils for Steam Kettles, 42 in. diameter	2.75
Files, 14 in., Half-round	.45
Forging Handles for holding coppers when dressing	.25
Forging Stake for forming coppers	2.50
Forging Hammers for forging coppers	1.00
Knives for peeling, per doz	1.00
Paste, per half-barrel	2.00
Paste, per barrel	2.50
Sal Ammoniac, per lb	.20
Spelter, per lb	.07
Syrup Gauges	1.00

Very few canners now make their own cans. Can-making is a specialty carried on in large factories with aid of improved patented machinery. As a rule, a cannery whose output does not exceed 5,000 cans daily can buy the cans cheaper than it can make them. Ready-made cans are sold at about $16

per 1,000 for 2-pound cans; $21.50 per 1,000 for 3-pound cans. By the car-load the cans cost a little less. They usually come packed in crates holding two dozen cans. The same crates are used to ship the packed goods in.

Solder costs 17 cents per pound; soldering fluid, 32 cents per gallon. Labels are always lithographed in colors, showing the kind of fruit contained and the name and address of canner. Labels cost from $1.25 to $2 per 1,000.

The standard size for cans is as follows:

No. 1, or one-pound.....2¾ by 4 inches.
No. 2, or two-pound.....3 7-16 by 4 9-16 inches.
No. 3, or three-pound.....4 3-16 by 4⅞ inches.
No. 10, or gallon.....6¼ by 7 inches.
All outside measurement.

Canned goods in the market are graded as follows: Extras, standards, seconds and pie fruit.

The following notes on manipulation will assist beginners in canning for market. But it must be fully understood that in canning, as in other practical arts, nothing will take the place of experience. Therefore those who go into the canning business should start on a small scale and increase business as experience warrants:

Apples.—Close, firm and sound fruit, not over-ripe. Best varieties for canning: Astrachan, Oldenburg, Maiden's Blush, Winesap.

Apples are always pared, cored and quartered. Pack solidly in 3-pound or gallon cans; use water as liquor. After capping, heat can 5 minutes in exhaust kettle to drive out the air, then seal vent and process or boil cans in open bath for 10 minutes for 3-pound cans; one-half hour for gallon cans. Apples pay well to can.

Peaches.—Best varieties to can are medium-sized, firm, yellow peaches. Elberta, Emma and Crawford's late are popular canning varieties. Peaches are pared, halved, stoned and solidly packed in 2-pound or 3-pound cans. Use plain water for pie and second-grade fruit. But for extras and extra standard grades a 10-degrees Brix sugar syrup is used. Exhaust can 5 minutes; process 10 minutes in open bath for 2-pound cans; 15 minutes for 3-pound cans. The higher grades of peaches are profitable to can and always find a ready sale.

Pears.—Best variety to can: Kieffer. Fruit must not be fully ripe. Pare, core and quarter the fruit. Plunge into boiling water for a few minutes and then into ice-cold water. This is called blanching. Pack solidly in 3-pound cans. Use a 10-degrees Brix sugar syrup as liquor. Exhaust cans 5 minutes; process in open kettle 20 minutes. Pears are very profitable to the canner.

Blackberries.—Best varieties to can: Wilson, Lucretia and Kittatiny. Fruit must not be over-ripe; spread on table and pick out all leaves and trash and all small, green and imperfect fruit. Pack fruit solidly, without washing, into 2-pound cans. Use water as liquor. Exhaust cans 3 minutes; boil or process in open bath for 10 minutes. All berries are put up in the same way as blackberries. But for strawberries a 10-degree sugar syrup is used. Berries pay fairly well to can.

Grapes.—Best varieties to can: Delaware, Niagara and Brighton. Grapes are canned exactly as berries. The grape berries are first hand-picked off the stems and all immature and unsound fruit rejected. Demand for canned

grapes is not large. A more profitable way to utilize the grape crop is to make it into jelly. See directions further on in this paper.

Tomatoes.—The tomato is more extensively canned than any other vegetable. Best varieties to can are Stone, Trophy and Paragon. Champion and Brandywine are also good. Tomatoes must be fully ripe, but not soft. Scald in steam or boiling water until skins crack. Remove peelings by means of a thin-bladed knife. Pack the peeled tomatoes, without slicing, solidly into 3-pound or gallon cans; use crushed tomatoes or pulp as liquor. Exhaust 10 minutes; process in open bath 20 minutes for small cans, 30 minutes for large cans. Tomatoes may be processed in closed bath at 240 degrees F. for 10 minutes, but such goods are always deficient in flavor and color.

The following vegetables all require a higher temperature than 212 degrees F.; therefore the closed bath must be used. Process at 240 degrees F. from 30 to 40 minutes:

Asparagus.—Use weak, boiling brine for liquor.

Snap Beans.—Use weak, boiling brine for liquor.

Green Corn.—Use weak, boiling brine for liquor.

Green Peas.—Use weak, boiling brine for liquor.

Okra.—Can only young and tender pods. Use weak, boiling brine for liquor.

Pumpkin.—Any variety may be canned. Scald whole fruit for 5 minutes and peel as in case of tomatoes. Slice and then grate or mash the flesh, rejecting seeds. Pack solidly into 3-pound cans without liquor. Exhaust 5 minutes; process in closed bath 40 minutes. Pumpkins pay well to can.

Squash is packed like pumpkin. The Boston Marrow is the favorite variety. Squash is profitable to can.

Sweet Potatoes.—Best varieties to can: Yellow Nansemond, Jersey Sweet and Vineless. Wash and boil the potatoes until the skin cracks. Peel and slice or quarter. Pack solidly in 3-pound cans. Use no liquor. Exhaust 5 minutes; process 20 minutes in closed bath at 240 degrees F. The demand for canned sweet potatoes is good and growing. Only the dry, mealy varieties are wanted. Should be more extensively canned. Pays well and can be made very profitable in the Southern States.

Jelly-making.—Pure fruit jellies have become scarce and high-priced on the market. The preparation of jellies can be profitably carried on in connection with canning fruits. Fruit too ripe for canning can be utilized for jelly-making. The fruits best suited for jelly-making are apple, pear, blackberry, grape, peach and plum. The currant also makes fine jelly.

To make jelly, only sound, fully ripe fruit may be used. Apples and pears are first grated and then crushed in a press, preferably of the hydraulic type. Berries and grapes are pressed without previous grinding. The juice as it runs from the press is filtered through a horse-hair sieve or a layer of finely chopped and well washed oat or rye straw. Sugar enough—ordinarily granulated sugar is best—is added to bring the density of juice up to 20 degrees on the saccharometer. The sweetened juice is then at once run into the boiling pan. The ordinary pan used in boiling sorghum or maple sap for syrup is equally suited for jelly-making. But a better grade of syrup and jelly can be made in a pan or boiler which excludes the air and prevents the formation of caramel. The best form of pan is a long covered and ventilated wooden trough having heavy copper steam-pipes running lengthwise of the box. The steam in the pipes must be under a pressure of not less than 80 pounds. The

South Allen Evaporator, made at Mt. Gilead, Ohio, is of this type and gives good satisfaction. Whichever pan is used, the heating surface must be hot enough to keep the juice boiling vigorously from start to finish. Only a shallow layer of juice should be run in at one time. The scum thrown up by the boiling juice must be carefully skimmed off. Not more than eight minutes' boiling should be required. Longer boiling darkens the product and also reduces its sweetness. The degree of condensation required to jellify differs with different fruits. Usually in making apple jelly, five parts of pure juice make one of jelly.

To one hundred pounds of clear juice we add about twenty pounds of sugar. The product is forty pounds of sweetened jelly. This can be sold at a handsome profit.

Fruit Juices.—There is a considerable demand for pasteurized fruit juices. These are used for making the syrups used in soda-water and for various other purposes. In making apple, pear and quince juice, the fruit is crushed and pressed as described for apple jelly. Berries and grapes may be pressed without crushing. The juice as it runs from the mill is filtered through finely chopped and well washed rye straw. It is then clarified by adding the white of two eggs for each gallon of juice. The egg should be beaten up thoroughly with a small quantity of juice and this stirred into the whole. Then heat to about 65 degrees F. Use thermometer and do not guess at temperature. Allow to stand covered and cooked, for two hours and siphon off the clear liquid into heavy opaque glass or earthen bottles or jugs, which must not be completely filled. Place the bottled juice in cold water bath, and heat until the water in bath begins to boil. Stand the bottles or jugs on brick to prevent cracking. Then seal bottles, air-tight, withdraw the fire and allow bottles to remain in bath until water is cold. Repeat the heating process once after twenty-four hours. Store the juice in a cool, dark, dry place.

Brandied Fruits.—Brandied fruits are put up and consumed in large quantities. To obtain the best results the most fastidious care is needed. The fruits most commonly put up in brandy are apricots, cherries, peaches, plums and pears. The fruit must be fully grown, sound and plump, but not ripe. Each fruit must be carefully wiped with a linen cloth and pricked to the center in several places with a silver or wooden fork or skewer. Then throw into a water bath heated to 200 degrees F. Remove bath from fire and let stand for 10 minutes. Then heat again until the fruit begins to rise to surface of water. Skim fruit out and throw into ice-cold water. After fruit is completely cold, drain and place in a tub holding brandy containing about 55 per cent alcohol. Let stand thus six days. Now place the fruit in the jars in which it is to be sold or preserved. To each gallon of the brandy in which the fruit has been soaked add four ounces of granulated sugar and heat to 200 degrees F. Do not boil. Cover the fruit in the jars with the hot sweetened brandy. Seal jars air-tight and put away in a cool, dark place. It is customary to add spice, usually essences of cinnamon, cloves and coriander, to the brandy in which the fruit is soaked before the fruit is put in. Pears must be peeled before soaking in brandy.

Marmalade and Apple Butter.—The lowest grade of sound fruit may be worked up into marmalade or fruit butter. The apparatus needed for this work is very simple. Where steam is employed, an ordinary barrel or hogshead is used to boil the fruit in. But a heavy cast-iron kettle set in a furnace will do quite as well. Apples, quinces and pears must be sliced or chopped,

but should not be peeled or cored. Place the chopped fruit in the cooker and cover with juice of the same fruit. Plain water will do, but this entails more work in evaporating the water. Boil until the fruit becomes soft enough to be easily run through a colander. Pass through colander to remove seeds, skins and cores. Add sugar to taste. The amount of sugar required depends upon the variety, natural sweetness and ripeness of the fruit used, and also upon the judgment of the operator and the demands of his trade. Usually in making apple marmalade, to every 100 pounds of apple paste from the colander 30 pounds of sugar is added. Cook again until the marmalade is reduced to desired consistency. Usually 100 pounds of fruit and 8 gallons of fruit juice, to which is added 30 pounds granulated sugar, make 110 pounds finished marmalade.

Fruit butter differs from marmalade in being spiced and using only 20 pounds of sugar to 100 pounds of fruit. Both these products keep well in ordinary covered wooden pails, if kept in a cool, dark place. To prevent molding cover the top of fruit with a circle of clean white paper, and upon this pour a thin layer of paraffine. The best marmalade is made from wild crabs. Wild plums and choke cherries also make marmalade and are very wholesome. Some people prefer quince marmalade to all others.

Jams.—The jams most commonly found in the market are made from a mixture of plums and blackberries in varying proportions. The following formula is used by a large commercial establishment:

Fresh ripe blackberries	100 pounds.
Apple or plum pulp	20 pounds.
Granulated sugar	106 pounds.

Directions: In plain water boil the apples or plums and pass through a colander. To the pulp thus prepared add the blackberries. Stir in the sugar and boil the whole for 10 minutes. Fill while hot into jars. Seal air-tight. The black or damson plum makes the best jam, but any plum will do.

Evaporating Fruits.—The fruits most commonly evaporated are apple, peach, prune, blackberry, raspberry and whortleberry. There is also a small demand for evaporated vegetables, such as corn, sweet potato and pumpkin. Of all evaporated fruits the apple is most popular and most extensively used.

Only good, sound, ripe and sweet fruit can be used. The apples are pared, cored and sliced or quartered by machines made for that purpose. The sliced or quartered fruit should be quickly dropped for five minutes into a weak brine made by boiling for 15 minutes one pound of salt in two gallons of clean, soft water. The brine prevents the fruit from discoloring. From the brine bath remove the fruit and place in shallow layers on a wide-bottomed tray. Most evaporator men subject the fruit at this stage to fumes of burning sulphur to bleach it. But if the brine bath is used no sulphuring is necessary. Sulphur bleaches the fruit and sets the color, but greatly decreases its food value and flavor. The brined fruit retains its natural color and fruity flavor. The salt used does not taste on the fruit. There are many styles of evaporators on the market, from the small affair to be set on the back of a cook-stove to the giant brick stack. All do good work. For farm use we especially recommend the all-metal Zimmerman, No. 3 or 4.

The heat is always supplied by a furnace below the evaporating trays. In the best forms of commercial evaporators there is an elevating arrangement worked by a crank, so that each fresh tray of fruit goes in at the bottom, and by turning the crank the whole super-imposed stack of trays is moved up one notch to make room for the next tray. By the time the first tray reaches the top of the stack the fruit is dry. The machine is thus continuous and usually works night and day throughout the drying season. The Trescott Evaporator Company of Fairport, N. Y., makes a good evaporator for commercial work. No evaporator having a capacity of less than twenty-five bushels of green fruit per day of 24 hours can be made to pay commercially. The larger the evaporator, the less the cost per pound of finished product. A complete outfit, including paring and slicing machines, for evaporating 100 bushels of apples daily can be installed for about $400. This is the smallest outfit we recommend for market evaporating.

The following figures as to profits on evaporated fruit are approximately correct for North Carolina:

One bushel of fresh apples will produce 6½ pounds of dried fruit, worth about 50 cents, at cost of 10 cents for labor and fuel.

One bushel of peaches will produce 6 pounds of dried fruit, worth about 50 cents, at cost of 15 cents for labor, etc.

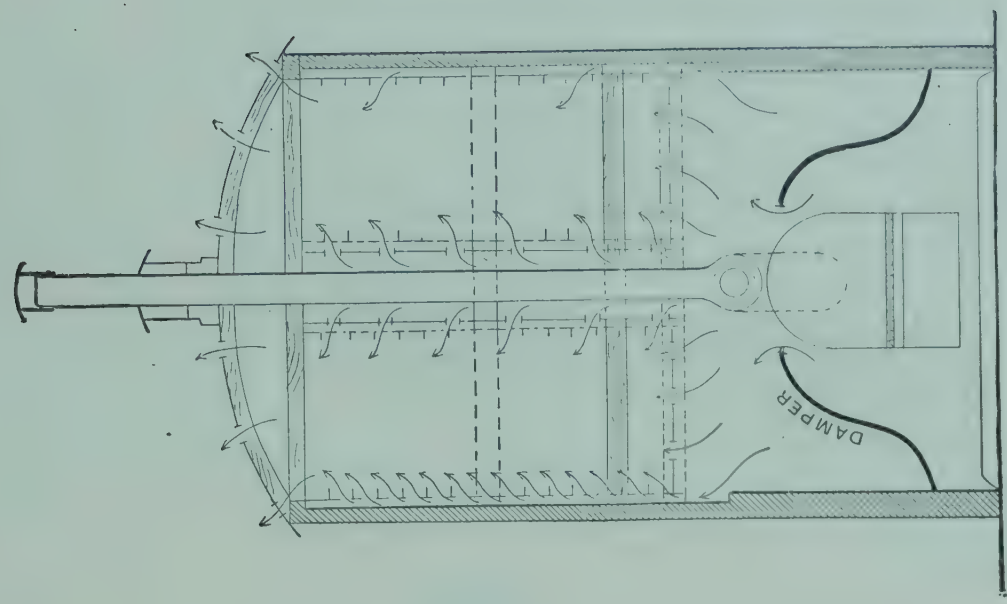

FIG. 2—Zimmerman Evaporator—Sectional View.

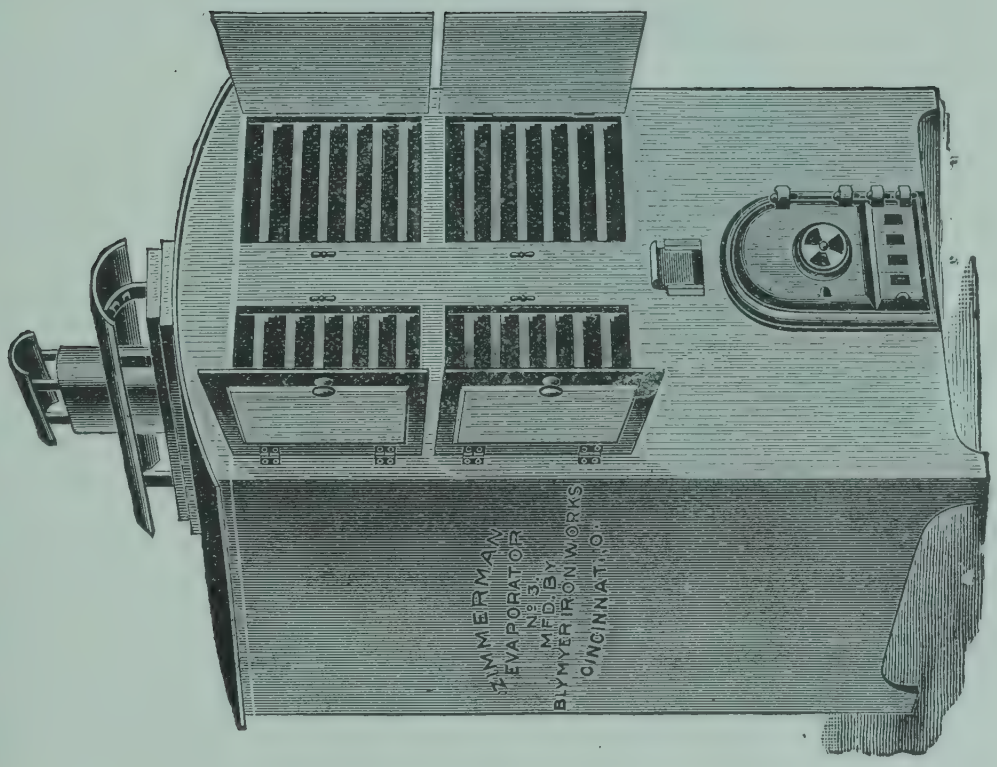

FIG. 1—Zimmerman Evaporator.

One hundred quarts blackberries will produce 40 pounds dried fruit, worth $4, at cost of 50 cents for labor, etc.

One hundred quarts of black raspberries will produce 30 pounds dried fruit, worth $6, at cost of 40 cents for labor, etc.

One hundred quarts of whortleberries will produce 40 pounds dried fruit, worth $6, at cost of 25 cents for labor, etc.

These profits are not great when the evaporator man has to buy his fruit at average market rates. But there are many localities where surplus fruit has no market value.

Canneries are more profitable than evaporators where skill and labor are attainable. The evaporated product is more concentrated and is easier to handle and transport. Every fruit-growing community should have a cannery or evaporator with capacity sufficient to work up all its surplus fruit. This will, by taking the surplus, prevent ruinous gluts and consequential breaking down of the market. The breaking down of the market on any early fruit not only spoils the sale of the remainder of the variety which has "slumped," but greatly injures the sale of all later fruits. As a rule, more fruit is wasted each year in every considerable fruit-growing neighborhood than would equip a good cannery or evaporator.

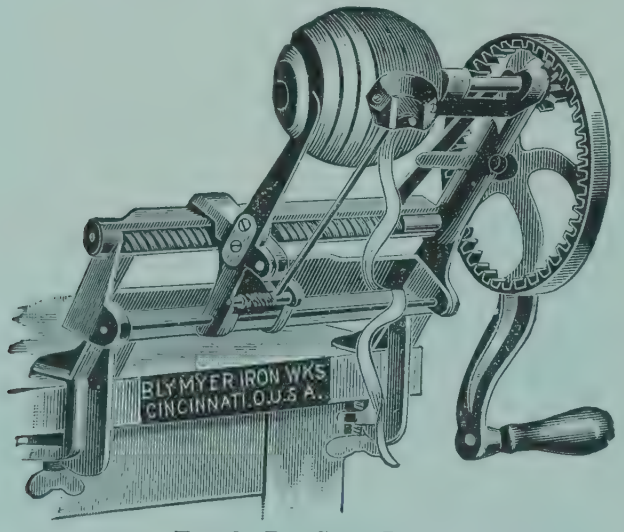

FIG. 3—Bay State Parer.

WINE-MAKING AT HOME.

By Gerald McCarthy,
Botanist and Biologist, Department of Agriculture.

Wine is a very complex body, though its chief constituents are only two—water, of which it contains 81 per cent to 94 per cent, and alcohol, of which it contains from 5.5 per cent to 14.5 per cent. The other constituents of wine are tannic acid, glycerine, tartaric acid, carbonic acid and succinic acid. Sweet wines usually contain also about 10 per cent of unfermented sugar, while "dry" wines should contain not more than a trace of sugar.

Fresh juice of ripe American grapes usually contains 12 per cent to 18 per cent of grape sugar, and from 0.5 per cent to 1.5 per cent of acid. The juice of European grapes contains more sugar than that of American grapes.

Theoretically, 100 parts of sugar in fermenting should produce 48.37 parts of alcohol and 46.57 parts of carbonic acid, 3.22 parts glycerine and 0.61 parts succinic acid. In practice, under the most favorable conditions, only about 45 parts of alcohol are produced by 100 parts of sugar. The transformation of sugar into alcohol is due to the growth in the liquid of millions of a minute, single-celled plant known to botanists as *Saccharomyces ellipsoideus*, and popularly called yeast. The alcohol is itself noxious to these plants or yeasts, and when it reaches a concentration equal to 15 per cent of the liquid, the activity of the yeast ceases. Therefore no pure grape wine ever contains much over 15 per cent of alcohol.

For making sound, wholesome wine the following apparatus and materials are required:

Sound grapes, fully ripe, but not decayed.

Clean vessels of suitable size for crushing, fermenting and storing the juice. These vessels may be of wood, tinned iron, glass or earthenware.

A saccharometer.

A floating or "dairy" thermometer.

A clean, odorless paddle or rod for stirring the juice.

Dippers, pails, hose, faucets, etc.

For home use we recommend making only dry red wine. White wine is difficult to keep without "fortifying" with alcohol, and fortified wines are not wholesome.

To make red wine the ripe grapes must be crushed in a vessel having holes near bottom to allow the juice to run out into another vessel placed below. This may be done by means of a wooden pestle or any crushing device. It is usually best to crush the stems of the grape bunches with the berries. These stems contain a large per cent of tannin, which substance is necessary for a long-keeping wine and is rather lacking in the berries, especially of grapes of the scuppernong type. The crushed grapes are at once put into the fermenting vat, which should be small, or not larger than a barrel. A weighted frame or porous cover is put over the crushed grapes to hold them down below the surface after fermentation has begun. The vat is then filled to within not more than 20 inches of the top. Fermentation will set in spontaneously within 12 hours and will become violent within 36 hours. It is usually completed within 10 days. The temperature of the juice or "must" at the beginning of fermen-

tation and during the entire process is a matter of very great importance. Ignorance of this fact is the main cause of the poor quality of most home-made wine. The temperature at the start should be below 60 degrees F. If necessary ice should be used to reduce the temperature of the fresh juice. For each degree of sugar shown by the saccharometer the temperature of the fermenting juice will be raised one degree F. But the yeast plants themselves are paralyzed at a temperature of about 95 degrees F. If we start with a juice at 75 degrees F. and the juice shows 25 degrees on the saccharometer, the maximum temperature attained before completion of fermentation will be 100 degrees F. This will absolutely kill the yeast plants, and we will have a "stuck" vat. If we start with an initial temperature of 60 degrees F. the highest temperature reached will be 85 degrees F., which is well within the limits of safety. If for any cause the temperature of the fermenting vat passes 85 degrees F. the juice should be at once cooled. This may be accomplished most easily by ærating the juice. A vigorous stirring will often suffice. Pouring the juice from one vat into another will do it. Keeping the outside of the fermenting vat wet will also help reduce the temperature. Finally, ice may be added to the vat, but this introduces an impurity into the juice and is not desirable. In order to keep the temperature down, small fermenting vats are preferable to large ones, as they offer greater surface for evaporation. If a vat gets "stuck" and fermentation ceases before all the sugar in the juice is transformed, it can be revived and finished by pouring the contents of the "stuck" vat into another vat in such a way as to thoroughly ærate the juice. To the new vat must be added one-fourth its capacity of fresh unfermented juice, and if practicable a quart or so of violently fermenting juice from another vat.

In hot climates or seasons the best plan is to gather wine grapes in the late afternoon, expose them in shallow layers to the night air. This will usually cool the grapes to a safe starting point, then rush the crushing and fermenting. Fermenting vats should always be kept in a cool cellar, which must be dry and well ventilated.

The completion of the fermenting process is indicated by the cessation of bubbles of carbonic acid gas to rise. When bubbles become rare, if your vat has not overheated and "stuck," the main fermentation is over and the new wine should at once be drawn off the pomace and lees. Have ready a clean, well-scalded vessel of nearly same size as the fermenting vat. In this should have been burned a little sulphur, or a strip of muslin saturated with fused sulphur. Fill this vessel completely with the new wine and place a grape leaf or loose cover of any kind over bung. Let stand thus in a cool place until no more bubbles of carbonic acid gas rise to the bunghole. Then drive in the bung as tight as possible, first filling the barrel, if necessary, until the liquid runs out at bung. Let it stand so with least possible disturbance for one month, then rack off into a fresh barrel, cleaned and sulphured as before. If at this racking the wine is still turbid it must be "fined." To "fine" red wine take the whites of six perfectly fresh eggs for each barrel of wine. Beat to a foam, add a tablespoonful of fine salt. Mix the whole with a quart of wine drawn from the barrel to be "fined." Then stir it in and vigorously agitate the whole. Let the barrel now stand another month tightly bunged and completely filled. Rack off again, and if the wine is sound it should be perfectly clear. After this the wine must be racked twice a year so long as it remains in the wood.

Red wines are usually not fit to drink until two years old. If wanted to keep longer the wine should be bottled when two or two and a half years old. In bottle it will keep as long as desired.

The market is over well supplied with chemical "preservatives" for wine and most other eatables. These substances are always advertised as "perfectly harmless." They are, in fact, when not worthless, poisons. They render wine or any food unwholesome, and should never be used. No preservative is needed if wine is properly made as above described. If the wine seems to have gone wrong in some way, and fails to keep, a good-sized pinch of dry mustard powder will help to keep a barrel from spoiling. But this will give more or less taste to the wine.

THE CATTLE TICK AND ITS RELATION TO THE CATTLE INDUSTRY OF NORTH CAROLINA.

By Tait Butler, State Veterinarian.

The cattle ticks cost Southern cattle owners millions of dollars annually. The truth of this alarming statement is plain from a most superficial examination of the abundance of positive evidence at hand. Still, thousands doubt even the positively established fact that ticks carry the germs which cause Texas fever, or "distemper," as it is called in this State; while thousands of others, notwithstanding all that has been published on the subject, are entirely ignorant or careless of the most simple facts concerning this, the most important question relating to the cattle industry of the South.

Cheap lands and a suitable climate, which insure long grazing seasons and unequaled facilities for the growing of forage crops, are real and important advantages possessed by the South in the production of cattle, but all of these are more than offset by the direct losses caused by ticks and the indirect but more serious losses from the market restrictions which their presence causes to be imposed on all cattle raised south of the national quarantine line. These losses exceed one-half cent per pound, and cattle-raising—in fact, no legitimate industry—can ever be successful under such a handicap. Therefore, the extermination of the cattle tick is the first great problem to be solved before the cattle industry of the South can attain real or successful development. Questions like breeds and breeding and feeds and feeding sink into utter insignificance beside it, because the best fruits of their development are impossible until the ticks have been exterminated.

The almost complete indifference everywhere manifest is due to familiarity with the presence of these ticks. The people say "This is the ordinary 'old-field tick' or 'seed-tick' which has always been on our cattle, and used to be much more numerous than at present. Our cattle did not die; in fact, we never heard of such a thing until late years."

While this is all true and clearly explained by the simple force of well-known facts, still, unless he takes the trouble to learn those facts, it appears incredible to the average man that these ticks can possibly cause the heavy losses for which they are solely responsible. Having an opportunity, because of my official position, to fully see and appreciate the immense losses caused in North Carolina every year through death from tick fever, in both native and imported stock, and the reduction in price of all our cattle because of the market restrictions imposed by the Federal quarantine, and knowing that the importance and magnitude of these are not realized by the cattle raisers of the State, and that many are still indifferent through lack of knowledge regarding many phases of the subject, this bulletin is written in the hope of arousing a little more interest and spreading information that will lessen the losses caused by the presence of this easily exterminable but deadly pest, the cattle tick.

THE TICK.

The tick that transmits the germ which causes Texas or tick fever in cattle is the *Boophilus annulatus*, commonly known as the "blue," "shingle," "distemper," or fever tick. It exists in eighty-four of the ninety-seven counties of this State, but in about forty of these which have had the "no-fence" or "stock" law for several years it is becoming much less numerous than in the remainder where "free range" still exists.

LIFE-HISTORY OF THE TICK.

The life-history of this tick is of much interest to those who would learn the best means of exterminating him. Most people are familiar with the appearance of the full-grown female tick engorged with blood. It is at this stage of her life that she drops off the cattle and, crawling under the leaves, grass or other material with which the ground may be covered, begins the laying of eggs for the reproduction of her kind. In warm weather this egg-laying usually begins in one or two days after she leaves the cow, but in cold weather, or if there be any other disturbing conditions, egg-laying may be prevented entirely. At least, our observations indicate that in the cool weather of spring and fall it is frequently a week after leaving the cow before it begins laying, and when the temperature is as low as ten to fifteen degrees below freezing no eggs at all are laid, even by fully engorged female ticks.

The number of eggs laid by each fully developed and engorged female tick varies from 1,500 to 3,500. We have counted as high as 3,403 eggs from one female, while others report as high as 4,000; but it is probably safe to state that the average is not far from 2,000.

From ten days to two weeks are consumed in laying these eggs, when the old tick, having exhausted the supply of blood which so greatly distended her body, presents a flattened, withered appearance and soon dies.

The eggs when first laid are light brown, but gradually become darker in color by age until almost black. Individually they are about the size of the period at the end of this sentence, but remain in masses and float readily on water. They are quite resistant to cold and other climatic conditions, and there is probably no part of North Carolina where these eggs, protected by leaves and dried grass, will not easily withstand our most severe winter weather.

In real warm weather these eggs hatch in about twenty days, but the hatching is greatly delayed, or prevented entirely, by cold. During spring and fall we have had it take from five to ten weeks, and as stated, if the weather be cold enough, hatching will be prevented entirely. Eggs kept sufficiently cold to prevent hatching for four and five months have, when warmth was applied, proved almost as fertile as if all the conditions had been favorable from the start. Therefore, even though it may be cold enough during the winter to kill all ticks not on cattle, the eggs remain unharmed and are ready to produce an "early crop" of ticks when sufficient warmth comes in the spring. Thus it is seen that it is the egg and not the tick that is usually carried over from fall to spring, especially in the northern and western parts of this State, but during mild winters ticks may be found on cattle at any time in any part of this State east of the Blue Ridge.

The young ticks of this and other species are popularly known as "seed-ticks." They are extremely small, but quite active, and collect in bunches on weeds, grass and twigs, and there wait for some suitable animal to come along and pick them up. They are able to wait a long while for such animal to brush its legs against the object upon which they are waiting. It is certain that they will live as long as three or four months in a bottle where it is impossible for them to get food, and it is probable they are able to wait as long on the grass and weeds. It is quite well established, however, that if no suitable animal is present for them to get upon they will surely die of starvation within four or five months, for they have no other means of obtaining food for growth. In this State this species of tick is seldom seen on other animals than cattle, but they are sometimes found on horses, mules and deer, and possibly very rarely on other animals also. When the young ticks get onto cattle they attach themselves principally to the under parts of the body, selecting the thin skin on the inside of the thighs and elbows and along the brisket. They change their position but little after once fastening themselves to the skin, and probably not at all, except possibly at the time of moulting. They moult or shed their skins twice—once from ten to twelve days after getting on the cattle, and again from four to six days later. After the first moult they possess eight legs instead of six, as when first hatched. Up to the time of the second moult the increase in size has been quite inconsiderable, but from this on for the next ten days or two weeks the increase in size is very rapid from the distension of their bodies with blood sucked from the cow. The time the ticks remain on the cattle varies considerably. The aggregate of the periods given above, about four weeks, is approximately correct for warm weather, but during the cool weather of late fall and winter we have known them to remain on for at least sixty days.

RAPID MULTIPLICATION OF THE TICK.

Since from six to eight weeks are sufficient under favorable conditions for the complete development of one generation, it is apparent that three and sometimes four generations may be produced during one season. This fully accounts for their great numbers in the fall, even when there have been but few during the early summer months. If but two eggs passed safely through the winter and one male and one female hatched in the early spring, by June 1st to 15th there might be 1,000 females ready to lay eggs, and by August 1st these would have 1,000,000 mature female descendants. Under usual conditions, still another generation might appear by October 15th, numbering 1,000,000,000 mature females. This, of course, presupposes perfect conditions for multiplication, which never exist, but it proves the necessity of destroying the first ticks that get on the cattle in the spring, if we are to easily prevent their ravages on the stock during the fall, and it clearly points to a time when their extermination is easy.

HOW TO DISTINGUISH THE FEVER TICK.

The male tick attaches himself to the cow very close to the female, but, owing to his extremely small size, not greater than twice that of an ordinary pin head, he is seldom seen unless searched for or pulled off with the large female. The distinctive characters of this tick by which the average stock-

man may distinguish it from other species are the structure of the mouth parts, especially when viewed with a magnifier. The red-brown color of the head shield, and its general form and markings. The parts back of the head shield are at first brown, but gradually become pale up to a few days before its complete development. In these last few days the tick fills very rapidly and the back takes on an "olive tint on a blue background and shows tortuous whitish vessels under the skin. The under parts show a deep or leaden-blue color."*

Seven other species of ticks have been found on cattle in the United States, but only one of these with very great frequency in North Carolina. This is the *Amblyomma Americanum*, or "lone star" tick, and is easily distinguished from the fever tick by the more rounded form of the body of the mature female, different and more prominent mouth parts, and a white spot on the rear margin of the head shield, from which it takes its popular name. It is seldom seen on cattle except during the spring and early summer, when it is quite numerous in some sections.

After August 1st any but the fever tick is extremely rare on North Carolina cattle.

The so-called "seed-ticks" are the young or small ticks of all the common species, while the "yearling" tick, as it is called, is a smaller species and not a half-grown stage of the fever tick, as popularly believed.

While, as stated, other species of ticks may be found on cattle, it is also true that the fever tick may be found on other animals. These are the horse, mule, deer and possibly still more rarely on others. In this State it is certainly very rarely found on any other animals, and for practical purposes may be considered as infesting only the cow, horse and mule.

HOW TO EXTERMINATE THE TICK.

In addition to the facts above enumerated concerning the life-history of the tick, the following should also be borne in mind in formulating plans for its extermination:

1. Neither old nor young ticks crawl far, and a fence with a rail or board tight on the ground will certainly stop them, but wire fences do not always afford protection.

2. Ticks do not go from one animal to another.

3. Eggs laid before the first of September will hatch the same fall, and unless the young ticks get on cattle, horses or mules they will die of cold or starvation before spring.

4. Eggs laid during the cold weather of late fall and winter do not hatch until the warm days of spring. It is therefore usually the eggs and not the ticks that are able to pass through the winters of the northern and western portions of this State.

With the foregoing facts in mind, three methods of destroying the ticks at once suggest themselves:

1. Keep all cattle, horses and mules out of the tick-infested pastures, lanes and lots after September 1st, and all eggs previously laid will hatch before cold weather and the young ticks starve to death before spring.

Care must be taken not to turn tick-infested cattle back into this pasture the next spring, as may easily be done, when, during a mild winter like the last

* Cooper Curtis.

one, cattle carry a few ticks all winter. If when the cattle are taken out of the infected pasture, September 1st, they be thoroughly cleaned of ticks and put on cultivated fields or other pastures where no cattle, horses or mules have run for six months, and are also prevented from picking up ticks in lots or lanes, the entire farm will be cleared of ticks by the next spring. If, however, the cattle are not cleaned when taken from the infected pastures, and are thereby enabled to scatter ticks over cultivated fields and in lanes and lots during the fall, they must be kept out of these the next summer or reinfection of the pasture will take place and all the efforts of the fall before be lost.

2. Divide the pasture by a fence with a rail or board tight on the ground, and the first year keep all cattle, horses and mules out of one-half after September 1st. The second year put the cattle on the half left vacant the year previous, and also provide new lanes and lots on ground over which no cattle ran the year before.

This plan necessitates reducing the number of cattle if the pasture has been stocked to its full capacity. It is also necessary to be certain that the cattle when turned out in the spring carry no ticks into that part of the pasture left vacant the fall before. This danger is not great, for, as previously stated, cattle seldom carry ticks through the winter in the northern and western parts of this State, but in all cases caution along this line is essential to prevent the possibility of reinfecting the pasture already cleared.

3. If practicable, burn the pasture over thoroughly early in the spring. Mix sulphur with the salt given the cattle—one part of sulphur to three parts of salt. Begin, not later than April 15th, greasing the legs and under parts of all cattle, and repeat it once a week all summer. While greasing the cattle look carefully for any ticks that may have escaped the grease or attached themselves to the upper parts of the body, and if any are found pick them off and burn. The grease may be one part kerosene and three parts any cheap sort convenient, such as the cheaper grades of cotton-seed oil. If a little sulphur and tar be added the effect will be prolonged and increased. The grease prevents young ticks from getting on the cattle and kills those already on by plugging the small openings in the body through which they breathe.

If the greasing and hand-picking be done thoroughly and no ticks allowed to drop in the pastures, lanes or lots for five or six months during the warm season, the effort will be successful.

This third plan for exterminating the ticks will be effectual if begun as early as September 1st, providing no ticks are allowed to mature and drop in the pastures after that date. It is also practicable if begun early in the spring and kept up until August, if in the meantime no ticks be allowed to mature on the cattle and drop in the pastures.

If operations be commenced in the spring they must be kept up longer than when begun September 1st, but in the spring the ticks are less numerous and the cattle consequently much more easily kept clean.

Either of the first two methods, when it can be adopted, is always certain to exterminate the ticks; but the third is not applicable to large herds, and will fail unless it is carefully and thoroughly carried out.

If the herd be large and a change or division of the pasture is impracticable, but it is still desired to exterminate the ticks, or at least reduce their numbers and thereby lessen their depleting effects on the cattle, much good may be done by an occasional spraying or dipping. Both these methods of attacking the ticks necessitate considerable expense for apparatus, which is only justified

when the herd is large. Moreover, no satisfactory substance has yet been found for use as a dip or spray when complete destruction of the ticks is aimed at. However, with a good spray pump, the cattle confined in a suitable chute, and a five-per-cent solution of zenoleum or chloro-naphtholeum, much good may be done by a careful spraying every ten days or two weeks, but the complete destruction of the ticks on a farm by this method is slow and difficult.

NATIONAL QUARANTINE LINE.

After it became established that ticks infesting Southern cattle carried the germs of Texas fever, the National Government established a cattle quarantine line, extending across the country from the Atlantic to the Pacific Ocean, located so as to place all tick-infested territory south of said line. The shipment of cattle from south of this line to any point north of the same is prohibited, except for immediate slaughter, and then only under certain severe restrictions.

The cattle, when reaching their destination north of the quarantine line, must be confined and unloaded at a separate part of the stock yards, the cars disinfected and the cattle sold at once for immediate slaughter, or returned south of the quarantine line.

In maintaining such a quarantine line the Constitution of the United States confines the National Government to State lines or interstate traffic; therefore, if any part of a State was found infested with ticks the whole State was placed under quarantine, unless the State authorities made satisfactory provision for guarding lines established within its borders. In such cases the Federal authorities exempt any portion of a State found free of ticks. Upon this basis, the State Board of Agriculture agreeing to guard the line across this State, the Federal authorities have exempted the following counties of North Carolina from all cattle quarantine restrictions: Cherokee, Clay, Macon, Jackson, Transylvania, Henderson, Graham, Swain, Haywood, Buncombe, Madison, Yancey, Mitchell, Caldwell, Watauga, Ashe, Alleghany and that part of Burke north of the Catawba River.

The National quarantine line as affecting North Carolina is therefore described as follows:

Beginning at the southwest corner of the county of Cherokee; thence east along the southern boundary-lines of the counties of Cherokee, Clay, Macon, Jackson, Transylvania and Henderson to the southwest corner of the county of Polk; thence northerly along the western boundaries of Polk and Rutherford counties to the southern boundary of McDowell County; thence westerly, northerly and northeasterly along the southern, western and northern boundaries of McDowell County to the western boundary of Burke County; thence southerly along the western boundary-line of Burke County to the Catawba River; thence easterly along the course of said river to the southwestern corner of Alexander County; thence north along the western boundary of said county to the southern boundary of Wilkes County; thence northwesterly along the boundary-line of Wilkes County to the western corner of said county; thence following the western and northern boundary-line of Wilkes County to the western portion of Surry County; thence northeasterly along the western boundary-line of Surry County to its intersection with the northern boundary-line of the State of North Carolina.

Under penalty imposed for violating State and Federal laws, no cattle shall be moved or allowed to move from the quarantine districts of this or any other State into that portion of North Carolina lying north and west of the above-described line.

WHAT THE FEDERAL QUARANTINE RESTRICTIONS COST THE CATTLE-OWNERS OF NORTH CAROLINA.

When cattle are shipped from eighty counties of North Carolina to any point north of the Federal quarantine line, where they must go to reach the best markets, they must be sold for immediate slaughter or go back south of the line. That is, they are not allowed to go on to northern pastures nor into northern feed lots. The advantages taken of these facts by the buyers, and the cost of other conditions and restrictions imposed, cause our cattle to sell for fully one-half cent per pound less than those of the same quality not subject to these quarantine restrictions.

A car-load of cattle, weighing 24,395 pounds, was recently shipped from below the quarantine line to Richmond, Va. They were compelled to go to the southern or quarantine division of the stock yards, because they came from a section where ticks exist on probably one-fourth the farms, although they themselves had never had ticks on them. A competent and reliable commission merchant was of the opinion that they sold for 30 cents per hundred pounds less than they would if they had been allowed to go into the northern or free section of the yards. That meant a loss of $73.18 on this one car-load of cattle. If they sold for 50 cents a hundred less, as another man competent to judge thought probable, the loss was $121.97.

If we add to this certain and definite loss the somewhat indefinite but none the less certain cost of disinfecting and placarding all cars used for carrying Southern cattle, and the cost of providing separate pens and unloading chutes, which the government requires, it is entirely safe to state that every animal of the cow kind sold by North Carolina farmers living south of the National quarantine line sells for fully one-half cent per pound less than it would but for the presence of the cattle tick.

There is a general impression that because few cattle are shipped to Northern markets the effects of the quarantine are not felt on the local markets; but this is certainly a plain mistake. It matters not whether the cow be sold to a neighbor, the local butcher or a shipper, she suffers this reduction in price of not less than one-half cent per pound; for the price of cattle is fixed for the whole country at the large markets north of the quarantine line. In other words, what the cow will bring on the large markets, less the expense of shipping, is the price she will command on the local market or on the farm; otherwise some one would ship her. According to the last census report, there were in 1899 about $1,060,000 worth of live cattle sold from the farms of the eighty quarantined counties. If we estimate the average price at 2½ cents, and the loss, as stated above, at ½ cent per pound, the total loss on cattle because of the National quarantine was one-fifth of $1,060,000, or $212,000.

The above conservative estimate approximately represents the loss to North Carolina from the direct effects of the Federal quarantine restrictions, but it does not by any means represent more than half the loss sustained from the presence of the cattle tick.

STATE OR PROVISIONAL QUARANTINE LINES.

Recognizing that the Federal quarantine restrictions were the greatest obstacle to the development of the cattle interests of the State, and that they could only be removed by the extermination of the ticks, which they believed to be practicable, the State Board of Agriculture selected the counties of McDowell, Burke, Caldwell, Wilkes and Surry in which to institute experimental work looking to the extermination of the cattle ticks in that territory. In order to prevent these counties, after having been cleaned, being reinfected from those lying to the south and east, a State or provisional quarantine line was established which forbids that cattle be moved or allowed to move, during any time of the year, into the counties of McDowell, Burke, Caldwell, Wilkes and Surry from any part of this or any other State under Federal quarantine; that is, from any section south or east of these counties.

Violation of this regulation is a misdemeanor under the State laws, and when known those guilty will be vigorously prosecuted. The results from this work have been quite satisfactory and will be fully discussed in a subsequent section of this bulletin.

THE TICKS AN OBSTACLE TO LOCAL CATTLE TRAFFIC.

Anything which obstructs or renders dangerous a legitimate local traffic in cattle is a great obstacle to the improvement of the quality of our stock and the proper development of the industry.

The interference with local traffic is greatest in the territory adjacent to the quarantine lines, where they cross the State from north to south. The counties west of the mountains are largely devoted to cattle-raising, and their cattle are far superior in quality to those in the eastern part of the State. Were it not for the quarantine restrictions and the presence of the tick the grain and grass-growing piedmont section should rapidly develop an interest in cattle-raising that would no doubt afford a market for considerable numbers of the better grade of cattle from across the mountains.

Moreover, several of the mountain counties are by the quarantine restrictions now cut off from their nearest and most suitable shipping points and are compelled to drive their cattle long distances into Tennessee and Virginia to reach a railroad point above the quarantine line. On the other hand, the grazing facilities of the mountain counties would, during the summer, afford a market for many of the best cattle from the adjacent counties on the other side of the quarantine lines were it not that such movement of cattle is prohibited except during the winter, when they are not needed. During the summer of 1902 an Ashe County cattleman informed the writer that he could buy cattle in Wilkes County for $10 per head that would be worth $20 per head if they could be taken across the quarantine line and put upon the pastures of Ashe and Alleghany counties.

Throughout all that part of the State south and east of the Federal quarantine line, and especially in the forty counties having the stock law, wherein more than half the farms are free of ticks, those who buy cattle during the winter or spring to run on their pastures during the summer are frequently heavy losers from death by tick fever. Large, old pastures are quite likely to be infested, and those having these tick-infested pastures cannot safely buy up cattle to graze upon them unless they are careful to secure immune cattle;

that is, those from tick-infested farms. These can be picked out with a fair degree of accuracy by the plainly visible scars or pits which they bear, produced by the ticks during the preceding summer; but since many farms will always remain free of ticks, and the cattle raised thereon will consequently be susceptible to tick fever, those with tick-infested pastures will always run great risks in buying cattle even from their nearest neighbors. Likewise those with tick-free farms must always be extremely careful not to introduce a tick-infested animal into their herds, or the loss will be most certain and severe. Scores of such instances of heavy loss, where the cause is a mystery to the owners, are reported to the State Veterinarian every year, and in the aggregate amount to an almost incredible sum.

Another very common loss results from the taking of cows from the towns to the country and placing them on tick-infested pastures. Ticks are seldom found on cows kept in town, and hence these cows are generally susceptible to tick fever. When they are no longer profitable for milk production, or become temporarily dry, they are frequently taken to the country to pasture. If the pasture happens to be infested with ticks, as is usually the case with pastures used for such purposes, these town cows are almost certain to die from tick fever.

All these frequently recurring losses, which are often heavy and usually entirely misunderstood by those upon which they fall, have operated to make the cattle business unprofitable, and in the opinion of the writer are chiefly responsible for the undeveloped condition of the cattle industry of the State.

DIRECT LOSSES CAUSED BY THE CATTLE TICKS.

Having briefly considered the indirect losses to the cattle industry of the State resulting from the presence of the cattle tick, those of a direct nature may now be discussed. These direct losses may be classed under three heads: First, the loss caused by the ticks sucking the blood and irritating the cattle and thereby retarding their growth. Second, the loss resulting from the obstacle the ticks offer to the improvement of the quality of our stock by rendering the importation of pure-bred animals for breeding purposes extra hazardous and expensive. Third, the loss by death from Texas or tick fever among native cattle.

THE TICK AS A PARASITE.

Ticks pierce the skin of the cattle and suck large quantities of blood, as shown by the rapid growth and immense size attained by the females. That this loss of blood and the irritation produced by the bites of the ticks are injurious to the animal and retard the growth of the steer and lessen the productive capacity of the dairy cow is apparent. What the exact loss is cannot be estimated, but that it is considerable will be readily conceded by any one who has seen an animal badly infested with ticks and compared it with one receiving the same food, but kept free of ticks. A man usually has only to learn of the presence of lice on his cattle to be stimulated to efforts to free them of those parasites, for he seems to fully realize the loss which they cause him; but, either through a lack of appreciation of the damage done by the ticks, or the fancied difficulty of exterminating them, many men see their cattle literally covered with ticks week after week and year after year without making any

effort to free them of these terrible pests. Certainly the ticks, being much larger parasites, when numerous do as great an injury to cattle as lice, and as great an effort should therefore be made to exterminate them.

A good illustration of the damage done by ticks, and the benefit derived from keeping the cattle free of them, recently came to the notice of the writer. When the cattle were about to be turned in the pasture in the spring it was noticed that one was very thin in flesh. An examination revealing lice, he was thoroughly covered with soap and other substances to kill them. A month or six weeks after being placed in the pasture the cattle were again examined. All were free of lice, but all except the one that had been protected from their attacks by the substances put on him to kill the lice were very badly infested with ticks. A comparison of the condition of the cattle showed that while the one that had been protected from the ticks was the poorest when put in the pasture, he was now in decidedly the best flesh. That the heavy infestation of ticks was the cause of all the other cattle not doing nearly so well seems apparent.

It is frequently stated that our pasture grasses are not so nutritious as those of other sections, and that our warm climate is not suitable for the growing of good cattle. In the opinion of the writer, much of this fancied lack of nutrition in our grasses and ill effects of our climate are but the effects of the cattle ticks. It will always pay to keep the cattle free of ticks, if for no other reason than to prevent the injury caused by their bites and the blood they suck. This may be easily done by any of the methods already suggested for their extermination.

THE CATTLE TICK AN OBSTACLE TO THE IMPROVEMENT OF THE QUALITY OF OUR CATTLE.

Such attempts as have been made in the past to introduce pure-bred breeding stock from the Northern States, for the purpose of improving the quality of our native cattle, have met with heavy losses in the death of from 50 to 90 per cent of all animals two years old or over soon after being placed on our tick-infested pastures. These losses were so heavy and certain that few have had the courage to take the risk in recent years. The progress made in developing a better grade of cattle has consequently been so slow that to-day our beef cattle bring from two to four cents per pound, while those of the Northern States fetch from four to six cents per pound on the same market.

The great need of the cattle industry of the State to-day is improved quality, which must be largely brought about by the introduction of pure-bred animals from the Northern States. With the growing interest in cattle-raising as one means of diversifying our agriculture, many more of our farmers would be willing to buy a good bull if it were not for the danger of losing him from Texas fever. Even if not more than 50 per cent die, a good bull will cost the North Carolina farmer from $300 to $400 when the chances of loss and transportation charges are considered. Such prices are regarded as too high under the present conditions of the industry.

With the fuller knowledge of the habits of the cattle tick, and the better knowledge of preventive medicine which the last decade has brought, the danger of losing animals brought from the tick-free Northern States has been greatly reduced.

HOW SUSCEPTIBLE CATTLE MAY BE BROUGHT TO NORTH CAROLINA WITHOUT DANGER OF SERIOUS LOSS FROM TICK FEVER.

Those who contemplate the introduction of cattle from north of the quarantine line, or from tick-free farms, should note carefully the following instructions, which alone can be depended upon to secure reasonable freedom from loss:

1. If the farm to which the cattle are to be taken be free of ticks it will only be necessary to prevent infection in moving them from the railway station to the farm. In any "stock-law" section, or in the northern and western parts of the State during January and February, this danger will not be great, but it can never be entirely avoided if the cattle are unloaded into the regular stock pens or driven over the public roads to the farm. They must be hauled from the depot in a wagon, or be thoroughly greased over the legs and under parts of the body and led home in the center of the road, where they will not come in contact with grass or weeds upon which there may be ticks; and then, to insure greater safety, again thoroughly greased after reaching the farm.

2. A bull may be taken to a tick-infested farm if before his arrival suitable quarters are prepared and the same precautions as above specified be observed in his transfer from the railway car to the farm. The quarters necessary to prepare on a tick-infested farm are as follows: Build a shed and yard in a field cultivated the year before and upon which no ticky cattle could possibly have been. Build a double fence around the lot, the outer being at least six feet distant from the inner. Arrange a pen just outside the outer fence, into which the bull may be taken for service without crossing any ground except that within his double-fenced lot. Clean each cow of ticks and thoroughly grease her before admitting her to the breeding pen, and when served remove her at once and return the bull to his quarters within the inner fence.

3. Cattle may be taken to a tick-infested farm, with only small loss, after artificial inoculation with the blood of a Southern animal that has become thoroughly immune, as indicated by tick infestation the previous summer. This inoculation gives the cattle a mild attack of the fever, which, after recovery, enables them to withstand a mild tick infestation.

The methods and conditions under which inoculation is most effectual for the prevention of tick fever will be fully discussed in a subsequent portion of this bulletin.

4. Those having tick-infested farms who do not deem it practicable to clean them of ticks should import nothing older than three or four months. If calves of this age are brought South in the spring they acquire an immunity during the first summer in the same way as the native calves, and the loss is small. Young calves, being only slightly susceptible to the disease, suffer from a mild attack and thereby acquire the ability to withstand subsequent gross tick infestations.

5. While the above methods lessen the losses from tick fever, they merely temporize with the difficulty. The best plan is to exterminate the ticks before attempting the improvement of the herd. In any "stock-law" section this may be quickly and easily done by following any one of the three methods proposed in a previous section of this bulletin.

TEXAS OR TICK FEVER.

Only in recent years has full attention been called to the extremely heavy losses resulting from tick fever among native Southern cattle. For many years it was known that Southern cattle, when taken North, although they remained in good health themselves, were in some way able to communicate the disease to Northern cattle. Also that when Northern cattle were taken South those over a year old nearly always contracted the disease during the first summer and from fifty to ninety per cent died. Since the discovery of the relations of the cattle tick to the transmission of the disease, and the advent of more competent veterinarians throughout the South, it has been learned that Southern animals raised without tick infestation are as susceptible to the disease as those raised in New York or Minnesota, and that the death loss among the native cattle, especially in those States just south of the Federal quarantine line, where ticks are less numerous than farther south, is probably greater from tick fever than from all other diseases combined. The loss in North Carolina alone is probably not less than $75,000 annually. These may appear extravagant statements, but a residence of ten years in the South, during which I have come in close contact with all the conditions involved, has convinced me of their accuracy.

Names: The disease caused by the germ which the Southern cattle tick *(Boophilus annulatus)* conveys to cattle is known by a large variety of names. Among these are Texas fever, Spanish fever, splenic fever, acclimation fever, Southern cattle fever, tick fever, distemper, red water, bloody murrain, town-cow disease and many others of local origin and application. It is also notoriously true that the diseases popularly believed to be dry murrain, loss of cud, hollow tail, hollow horn, etc., are very frequently plain cases of tick fever.

Distribution: Tick fever is always more prevalent where the tick-free and tick-infested farms are about equally numerous, but so long as any ticks exist in a section tick fever is certain to prevail to a greater or less extent. On the other hand, where tick infection is very general tick fever is less common in the native cattle, but in the worst tick-infested sections there are always tick-free pastures and lots, and consequently considerable numbers of cattle escape until of an age that renders them susceptible to the disease. Therefore, tick fever occurs in all the eighty counties south and east of the Federal quarantine line, but is most common in the central portions of the State, where more than half the farms are free of ticks and consequently more than half the cattle susceptible to the disease.

Susceptibility: At birth calves are only slightly susceptible to tick fever, but their susceptibility gradually increases with age until maturity. Cattle over two years old, exposed to tick infestation for the first time, practically all contract a more or less severe form of the disease. Therefore, while all cattle are more or less susceptible, and there are no doubt varying degrees of susceptibility in cattle of the same age, yet the degree of susceptibility is almost entirely a question of age.

It has been stated that Northern cattle are more susceptible to tick fever than those raised free of ticks in the South, and that if an animal brought from the North be kept free of ticks its first summer in the South it will thereafter be better able to resist tick infestation. Such statements are misleading and not borne out by experience; for cattle raised in the South, but kept free of ticks until mature, nearly all die from the disease if subsequently infested,

and the same fatal results usually follow when imported cattle are kept free of ticks their first summer in the South, but are later exposed to infection.

In short, whether raised in Mississippi or Minnesota, all calves are but slightly susceptible to tick fever, while all mature cattle raised free of ticks are highly susceptible. In other words, location and climate have little or no influence in determining susceptibility, it being purely a question of age and freedom from previous tick infestation.

Cause: The specific cause of tick fever is an extremely small "germ" *(Piroplasma bigeminum)*, belonging to the lowest forms of animal life, the protozoa. When introduced into susceptible cattle these little animals attack the red blood cells and quickly destroy large numbers of them. So rapidly destructive is this attack that a count may show 7,000,000 corpuscles to a given quantity of blood at the first signs of disease, while two days later the number will have decreased to less than 2,000,000. Such a rapid destruction of the vital fluid means a serious disturbance of body functions, and it is therefore little wonder that death is frequently a prompt result, despite any and all forms of treatment.

Mode of Transmission: While the disease may be conveyed to susceptible cattle by inoculation with the blood of an animal suffering from an attack or that has been previously infested with ticks, still in nature there is no known means by which tick fever is conveyed to cattle except through the agency of the common Southern cattle tick, *Boophilus annulatus.*

The parasites which produce tick fever probably always exist to some extent in the blood of a cow after her first tick infestation. When the female ticks suck the blood of such an animal they take into their own bodies these small parasites and in some form convey them through their eggs to the succeeding generation of young ticks. When these young ticks, therefore, get onto a susceptible animal they pierce its skin and introduce the small parasites into its blood.

While it is quite certain that all ticks of the species *Boophilus annulatus* do not carry the parasite of tick fever, and that these are consequently not capable of conveying the disease, it is equally certain that nearly all of them do; and since there is no known means of foretelling whether young ticks are infective or not, the only safe plan is to regard all ticks of this species as capable of transmitting tick fever to susceptible cattle. However, it is generally conceded that horses and certain other animals upon which these ticks sometimes develop are not susceptible to tick fever; that is, the small animal parasites which cause the disease do not live in the blood of those animals, and consequently young ticks whose mothers developed upon them are not capable of conveying the disease. This fact may account for occasional instances of the tick failing to convey tick fever to susceptible cattle.

It is also probably true that there are varying degrees of virulence or disease-producing powers in different lots of ticks of this species, and this may account in part for the different degrees of severity in different outbreaks of the disease, but there is very little known on this subject. It is probable, however, that ticks hatched from eggs that have passed through the winter before hatching are less virulent than those of the later or fall generations.

While a very few ticks sometimes produce a fatal case of the disease, as a general rule the greater the number of ticks the more severe the disease.

Period of Incubation: When susceptible cattle are inoculated with the blood of one that has been infested with ticks, or when young ticks are placed

directly upon susceptible cattle, an elevation of temperature and other evidences of tick fever usually develop within from seven to ten days.

In practice we may therefore expect tick fever to develop within from seven to ten days after placing susceptible cattle on a tick-infested pasture, providing the cattle get ticks on them at once; but unless the ticks are extremely numerous, part or all of the cattle may not become infested for several days; hence, the development of the disease in such animals will be correspondingly delayed. It should also be remembered that while the period of incubation is usually from seven to ten days, as stated, there are exceptions to this rule where the period is much longer.

When infection occurs through placing a tick-infested cow on a tick-free pasture containing susceptible cattle, the ticks must mature, drop off the cow and lay eggs, and these must hatch and the young ticks get on the susceptible cattle and remain there from seven to ten days before tick fever can develop. This will not be less than four weeks, is usually from five to seven weeks, and in cold weather may be much longer.

Symptoms: The first symptoms noticed by the owner or attendant are usually those common to feverish conditions—namely, standing or lying apart from other members of the herd, more or less loss of appetite, cessation of cud-chewing, constipation, dry muzzle, etc. An elevation of temperature of from four to seven degrees* precedes and accompanies these symptoms. As the disease advances and becomes more severe, all symptoms become aggravated. If the animal stands, the back is arched, head lowered, ears drooped, breathing and pulse fast, temperature remains high, the constipation is followed by diarrhœa and reddish-colored urine is passed.

While the disease can only be diagnosed with absolute certainty by a microscopic examination showing the germs in the blood, for the practical needs of the owner the following will be sufficient: Has the animal ever been infested with ticks before? Are there ticks on it now? Has any animal been introduced that might have brought ticks to the place, or has the diseased animal been moved or in any way exposed to tick infestation, and does she pass reddish-colored urine?

With these questions answered in the affirmative, the existence of tick fever may be considered as practically certain, but one source of frequent error must be avoided. We have already learned that the ticks are very small when they get on the cattle, and grow but little during the first ten days, but during these ten days the disease has had ample time to develop. Therefore, it is not uncommon that, although the ticks be present, it requires an extremely careful examination to find them. As a result, many animals contract the disease, die and are disposed of without tick fever ever being suspected, because the ticks have not become large enough to be seen by the average person. However, even if ticks be not found, with the history of a susceptible animal, a possible tick infestation and the passage of apparently blood-colored urine, it is practically safe to consider the case one of tick fever. The urine may vary in color from only slightly above normal to a dark reddish brown. This is not due to the presence of blood, but to the coloring matter of the broken-down red blood cells which is filtered out by the kidneys.

Course and Termination: The usual course of the disease is a rapid one, with early death, or cessation of the aggravated symptoms within from five to

*The normal temperature of the cow is from 101 to 102 degrees; pulse rate 55 to 60 per minute.

ten days, and subsequent recovery, but there sometimes develops a secondary or chronic form of the disease that may end fatally after several months if the animal fails to receive good care and feed. This form is especially common in calves, which may suffer during the summer with so slight an attack as to entirely escape the notice of the owner, but when the pastures become short and dry, and the cold weather of fall and winter comes on, the depleting effects of the early attack are felt to an extent that causes them to die of anæmia or lack of blood. Many of these cases are very puzzling to the owners, as they show no special evidence of disease, but gradually get poorer and poorer, although eating fairly well, until finally diarrhœa sets in, swellings appear along the under parts of the body, and death results from inanition.

In animals under six months of age the disease is rarely fatal; in those from six months to one year, from ten to twenty-five per cent die; from one to two years, twenty-five to fifty per cent, and in those over two years old the death-rate is from fifty to ninety per cent.

Appearances After Death: The changes in the appearance of the different organs are quite numerous and of great importance to the veterinarian in aiding him to decide whether the animal died of tick fever, but only a few of the more pronounced of these are of much value to the average stock-owner, owing to his lack of familiarity with natural conditions.

If the animal has lived several days after the onset of the disease, the tissues just beneath the skin may or may not present a yellow appearance. In such cases the red meat may appear paler than usual. There may also be some congestion of the fourth stomach and the intestines. The dry condition of the contents of the manyplies, or book; is of little significance, although made much of by those unfamiliar with such matters. If death resulted early in the disease, the kidneys will be enlarged and of a uniform dark-brown color.

The most marked changes occur in the liver, melt, heart and the contents of the bladder.

If death resulted in one or two days after the beginning of the disease, the liver will be darker than usual, enlarged, with rounded edges, and engorged with blood. If death was delayed a few days later, the liver will be yellow, especially on cut surfaces, from engorgement with bile, and the gall bladder will be distended, with a thick, ropy bile. The melt will be much enlarged, dark in color, and engorged with a bluish-black substance, having a tendency to slowly run out when the organ is cut, and to gravitate to one end when the organ is held up by the other.

In these rapidly fatal cases the bladder usually contains more or less highly-colored or reddish-brown urine, but this is not present in those cases that die after the subsidence of the high fever. The heart shows small red spots on both outer and inner walls. In chronic cases there is little to be noted except the extreme emaciation and bloodless, pale condition of the entire body.

Treatment: Good care and nursing are of the greatest importance. The animal should be kept in a cool place and allowed free access to water.

Since the severity of the attack seems to depend to a considerable extent on the degree of tick infestation, the animal should be cleaned of ticks as soon as possible. This may be done by thorough greasing, but as covering the surface of the body with grease may tend to raise the temperature, it would be better to wash in a watery solution of some such substance as creolin—one of creolin to twenty-five of water—which will have a tendency to lower temperature.

Give a purgative of from one to two pounds of epsom salts (according to the size of the animal), dissolved in a quart of warm water. Follow with two to three drachms of quinine and one to three ounces hyposulphite of soda every four or five hours.

When the fever has subsided, give alcoholic stimulants and tonics of iron and nux vomica with liberal but judicious feeding. When the disease first makes its appearance, all the susceptible cattle in the herd should be thoroughly greased once a week to remove such ticks as may already be on them, and prevent further gross infestation.

Immunity: Cattle are said to be immune to tick fever when tick infestation produces no marked disturbance of health. So far as we know, this is only brought about in mature animals by an attack of the disease and a high degree of immunity only after repeated attacks or tick infestation. While practically all mature cattle show a high degree of susceptibility to tick fever, nearly all calves possess at birth a high degree of immunity. This natural immunity of the calf is gradually lost from birth to maturity; but if when only a small part of this immunity has been lost—say when the calf is from four to six months old—it becomes infested with ticks, a mild attack of the disease is produced. This attack is usually so mild that it is not noticed at all, but it confers an artificial immunity to subsequent tick infestation. That is, as the calf is losing its natural immunity possessed at birth, it acquires, through repeated tick infestations and repeated mild attacks of the disease, a complete artificial immunity to even gross tick infestation. This is what occurs with all calves raised on tick-infested pastures, and accounts for the fact that where ticks are numerous and get on all the calves while young, death from tick fever in such native stock is rare.

CONFERRING IMMUNITY ON IMPORTED CATTLE BY INOCULATION.

For many years yet, portions of the State will remain infested with ticks, but in those very sections pure-bred bulls are most needed for the improvement of the quality of the cattle; therefore, the question of inoculation to protect imported cattle against tick fever is a very important one to the tick-infested part of the State.

In recent years there has been developed a form of inoculation which reduces the loss from tick fever to a minimum, and no one should expose an animal over six months old to tick infestation for the first time without having him inoculated. The operation is a comparatively simple one, and may be performed by any physician or careful stockman. The only instrument needed is a good, strong hypodermic syringe, thoroughly disinfected in a five-per-cent solution of carbolic acid.

The animal selected from which to extract the blood for the inoculation must be in good health, at least two years old, and one that was certainly infested with the fever tick the preceding summer. Cut the hair off an area as large as the hand, along the course of the jugular vein, and wash and disinfect the skin of the part thoroughly with a solution of corrosive sublimate—one part of corrosive sublimate to 500 parts of water—or with a five-per-cent. solution of carbolic acid, such as used to disinfect the syringe. Throw and tie the animal, and draw a cord tightly around the neck, so as to stop the flow of blood in the jugular vein, as for bleeding. Insert the needle of the hypodermic syringe obliquely into the vein, with the point towards the animal's

head; draw a syringe full of blood, and at once inject one cubic centimeter (about 15 drops) under the skin of the animal to be inoculated.

In from seven to ten days the inoculated animal will develop a case of tick fever which is usually of a mild type. If the attack is a severe one, it should be treated as directed for tick fever in a foregoing section of this bulletin. In a few cases fever may not develop before anywhere from the tenth to the thirtieth day after inoculation, and in some cases the attack is so mild that it will require close watching and the use of the thermometer to detect any disturbance whatever. In those cases which are regular and show a decided rise of temperature in from seven to ten days after inoculation, there is generally a second attack, occurring about twenty days later, of a milder nature than the first. After recovery from the second attack produced by the first inoculation, a second inoculation may be made if desired. While this is probably best, it is not necessary, if care be taken to insure that the first infestation of ticks be a light one. All ticks must be kept off the animal until full recovery from the inoculation fever, but they should always be allowed to get a few ticks on them as soon thereafter as possible. If this is not done—that is, if they run until fall before becoming infested with ticks—the more virulent and numerous infestation which is likely to occur at that time may result fatally. As tick fever is much more severe in warm than in cold weather, the inoculation should be made during the winter.

If the calf be too young, the attack of the disease produced by one inoculation will be so mild that it will not protect it from a later gross infestation of ticks; while on the other hand if the inoculated animal be too old the attack is likely to be so severe that death may result. Therefore, only animals from nine to fifteen months old should be selected for inoculation.

The cattle should be brought South in December and inoculated as soon as rested. In February a second inoculation may be made if desired, and the animals be ready to go on the tick-infested pastures in April.

The death loss by inoculation and subsequent tick infestation is extremely small—not more than five per cent—where proper care is exercised. Out of forty-two head inoculated by the writer during the last year, only one has died from the inoculation fever, and none from subsequent tick infestation, although some of them have carried hundreds of ticks. The loss in animals of this age without inoculation would probably not have been far short of fifty per cent.

The inoculated animals do not do well the first summer unless they receive good care and food, but the second season they seem to do as well as those immunized in the natural way—that is, by tick infestation from calfhood up.

In order to encourage the introduction of improved cattle, the State Veterinarian will inoculate pure-bred animals for citizens of the State free of charge, except actual cost of food and care. When requested, he will also select and purchase such stock as any citizen of the State may need, and, when necessary, inoculate and ship to farmers at actual cost.

Those desiring to purchase pure-bred animals should communicate with the State Veterinarian, who will be glad to serve any he may in the selection and inoculation of such stock.

Hereafter it is hoped that the Department will be able to keep on hand a few inoculated bulls to meet the demands of those living in the infected portion of the State. These will always be pure-bred registered animals, representing the more popular breeds, and will be sold at actual cost.

THE PROGRESS AND FEASIBILITY OF TICK EXTERMINATION IN NORTH CAROLINA.

That the extermination of the cattle tick is not only feasible, but also an extremely easy matter, has been demonstrated by the progress of the work already done by the Department of Agriculture, if such had not been apparent from a knowledge of the life-history and habits of the tick. In three years five counties west of the mountains that contained considerable infection, and one and a half counties east of the Blue Ridge, have been practically cleared of ticks. In addition, half of Wilkes County and that part of Burke County south of the Catawba River are so nearly cleared as to make it quite certain they will be exempted from all quarantine restrictions next year.

To show that this work pays, let us take as examples Henderson and Wilkes counties. During the spring of 1902 certain quarantine restrictions were placed on a part of Henderson County by the Federal authorities. During the existence of these restrictions cattle sold in Hendersonville at from 2½ to 3 cents per pound. On the pledge of the Henderson County Cattle Association and the Department of Agriculture to exterminate the ticks, or at least quarantine the infected cattle, these quarantine restrictions were removed by the Federal authorities. Within three weeks cattle advanced to from 3 to 4 cents per pound in Hendersonville because the cattle could be taken to other markets. This meant the saving of several thousand dollars to Henderson County. But what did it cost to exterminate the ticks? Through a special act of the Legislature, the county had obtained authority to expend $200 per year from the county funds for employing inspectors to locate and quarantine the tick-infested farms and instruct the people in the best methods of exterminating the ticks. With this small expenditure, and the active interest and co-operation of the people, the ticks have been practically exterminated in two years.

The work in Wilkes County has been conducted entirely by the State Department of Agriculture, and, unfortunately, without that co-operation on the part of the cattle owners which ought to have been given. It will have occupied four years when completed, but the cost has not been to exceed $3,000 in all. But let us see what freedom from quarantine restrictions means to Wilkes County. There were sold from the farms of the county during 1900 fully $40,000 worth of live cattle. The average price was from 2½ to 3 cents per pound. If, as we have shown in a previous section of this BULLETIN, the loss was one-half cent per pound because of the quarantine restrictions, these cattle would have brought one-sixth to one-fifth more if the cattle traffic had been unrestricted, or a gain of more than $6,000. That is, the entire cost of exterminating the ticks, extending over a period of four years, is less than one-half the amount gained in one year by freedom from quarantine restrictions.

These facts and conditions apply to any county now under quarantine where the "stock law" is in force.

HOW HAS THE WORK BEEN DONE?

Inspectors are employed, who make a farm-to-farm canvass of the territory, with a view to locating all tick-infested farms, which are immediately quarantined and the owners instructed as to the importance and objects of the work and as to the easiest and best means of exterminating the ticks on their places.

Daily reports are made to this office by the inspectors, showing the number of miles traveled, the number and location of farms visited, number of cattle

inspected, and the presence or absence of ticks. In this way the exact location of all the infected farms and cattle in each county is known and the work kept in hand, so that an intelligent direction of it is possible.

During the summer of 1902 I addressed farmers' meetings relative to this work at from six to ten places in each of the counties of Surry, Burke and Wilkes, as a result of which organizations were formed in all of these counties, which, through local or township committees, are co-operating with and helping the Department in the work to an extent and effectiveness never before realized.

HOW THIS WORK SHOULD BE DONE.

Each county under quarantine should obtain, through an act of the Legislature, authority to expend from $200 to $400 annually from the county funds for the employment of local inspectors to make a farm-to-farm canvass of the county and locate all tick-infested farms. The cattle on these farms should be quarantined and the owners instructed as to the best methods of exterminating the ticks. A county association should be organized, with committees of prominent interested men in each township to aid in inducing the owners of tick-infested farms in their respective sections to exterminate the ticks on their pastures. The Department of Agriculture will prevent the reinfecting of such counties by prohibiting the introduction of cattle from infected counties or sections, and assist, as far as its facilities will permit, in making the inspections thorough, and in educating the local inspectors and the owners of stock as to the importance of the work and the best methods of conducting it. The work of tick extermination now being carried on by the State Department of Agriculture will probably be continued to the full measure of its available resources, but as these are limited we cannot, without the active help of the counties directly interested, hope to free more than one or two counties each year. With the help of the people in the manner suggested, every county now under quarantine that has the "stock law" might be cleared of ticks and released from all quarantine restrictions during the next three years at a cost for the entire work of not more than one-half the annual benefits that would result therefrom.

FERTILIZER ANALYSES.

FALL SEASON, 1902—SPRING SEASON, 1903.

By B. W. Kilgore, State Chemist.

The analyses presented in this Bulletin are of samples collected by the fertilizer inspectors of the Department, under the direction of the Commissioner of Agriculture, during the fall months of 1902, and the spring months of 1903, and therefore represent the character of fertilizers the farmers have used on the crops of the past year. They should receive the careful study of every farmer in the State who uses fertilizers, as by comparing the analyses in the Bulletin with the claims made for the fertilizers actually used, the farmer can know whether or not they contained the fertilizing constituents in the amounts they were claimed to be present.

Terms Used in Analyses.

Water-soluble Phosphoric Acid.—Phosphate rock, as dug from the mines mainly in South Carolina, Florida and Tennessee, is the chief source of phosphoric acid in fertilizers.

In its raw or natural state, the phosphate has three parts of lime united to the phosphoric acid (called by chemists tri-calcium phosphate). This is very insoluble in water, and is not in a condition to be taken up readily by plants. In order to render it soluble in water and fit for plant food, the rock is finely ground and treated with sulphuric acid, which acts upon it in such a way as to take from the three-lime phosphate two parts of its lime, thus leaving only one part of lime united to the phosphoric acid. This one-lime phosphate is what is known as water-soluble phosphoric acid.

Reverted Phosphoric Acid.—On long standing, some of this water-soluble phosphoric acid has a tendency to take lime from other substances in contact with it, and to become somewhat less soluble. This latter is known as reverted or gone-back phosphoric acid. This is thought to contain two parts of lime in combination with the phosphoric acid, and is thus an intermediate product between water-soluble and the original rock.

Water-soluble phosphoric acid is considered somewhat more valuable than reverted, because it becomes better distributed in the soil as a consequence of its solubility in water.

Available Phosphoric Acid is made up of the water-soluble and reverted; it is the sum of these two.

Water-soluble Ammonia.—The main materials furnishing ammonia in fertilizers are nitrate of soda, sulphate of ammonia, cotton-seed, dried blood, tankage, and fish scrap. The first two of these (nitrate of soda and sulphate of ammonia) are easily soluble in water and become well distributed in the soil where plant roots can get at them. They are, especially the nitrate of soda, ready to be taken up by plants, and are, therefore, quick-acting forms of ammonia. It is mainly the ammonia from nitrate of soda and sulphate of ammonia that will be designated under the heading of water-soluble ammonia.

Organic Ammonia.—The ammonia in cotton-seed meal, dried blood, tankage, fish scrap, and so on, is included under this heading. These materials are insoluble in water, and before they can feed plants they must decay and have their ammonia changed, by the aid of the bacteria of the soil, to nitrates, similar to nitrate of soda.

They are valuable then as plant food in proportion to their content of ammonia, and the rapidity with which they decay in the soil, or rather the rate of decay, will determine the quickness of their action as fertilizers. With short season, quick-growing crops, quickness of action is an important consideration, but with crops occupying the land during the greater portion of all of the growing season, it is better to have a fertilizer that will become available more slowly, so as to feed the plant till maturity. Cotton-seed meal and dried blood decompose fairly rapidly, but will last the greater portion, if not all, of the growing season in this State. While cotton seed and tankage will last longer than meal and blood, none of these act so quickly, or give out so soon, as nitrate of soda and sulphate of ammonia.

Total Ammonia is made up of the water-soluble and organic; it is the sum of these two.

The farmer should suit, as far as possible, the kind of ammonia to his different crops, and a study of the forms of ammonia as given in the tables of analyses will help him to do this.

Form of Potash in Tobacco Fertilizers.

Tobacco growers are becoming yearly more disposed to know the form of potash, whether from kainit, muriate or sulphate, which enters into their tobacco fertilizers. Considerable work of this kind has been done for individuals, and we are this season for the first time determining the form of potash in all tobacco brands, for the benefit of tobacco growers.

The term potash from muriate, as reported in the analyses, does not mean, necessarily, that the potash was supplied by muriate of potash. Sulphate or some other potash salt may have been used, but in all fertilizers where the term potash from muriate is used, there is enough chlorine present to combine with all the potash, though it may have come from salt in tankage, kainit, or carnalite. As the objection to the use of muriate of potash in tobacco fertilizers arises from the chlorine present, it does not matter whether this substance is present in common salt or potash-furnishing materials.

The use of sulphate of potash where there is chlorine present in the other ingredients of the fertilizer will not prevent the injurious effect of the chlorine. The term potash from muriate in our analyses, therefore, means that there is sufficient chlorine present in the fertilizer from all sources to combine with the potash to the extent indicated by the analyses.

Valuations.

To have a basis for comparing the values of different fertilizer materials and fertilizers, it is necessary to assign prices to the three valuable constituents of fertilizers—ammonia, phosphoric acid and potash. These figures, expressing relative value per ton, are not intended to represent crop-producing power or agricultural value, but are estimates of the commercial value of ammonia, phosphoric acid, and potash in the materials supplying them. These values

are only approximate, as the cost of fertilizing materials are liable to change as other commercial products are, but they are believed to fairly represent the cost of making and putting fertilizers on the market. They are based on a careful examination of trade conditions, wholesale and retail, and upon quotations of manufacturers.

Relative value per ton, or the figures showing this, represents the prices on board the cars at the factory, in retail lots of five tons or less, for cash.

To make a complete fertilizer, the factories have to mix together in proper proportions materials containing ammonia, phosphoric acid and potash. This costs something. For this reason it is thought well to have two sets of valuations—one for the raw or unmixed materials, such as acid phosphate, kainit, cotton-seed meal, etc., and one for mixed fertilizers.

The values used last season were:

VALUATIONS FOR 1902.

In Unmixed or Raw Materials.

For ammonia	13	cents per pound.
For phosphoric acid in acid phosphate	4	cents per pound.
For phosphoric acid in fine bone meal	3	cents per pound.
For phosphoric acid in medium and coarse bone meal	2½	cents per pound.
For potash	5	cents per pound.

In Mixed Fertilizers.

For ammonia	15	cents per pound.
For phosphoric acid	4½	cents per pound.
For potash	5½	cents per pound.

The valuations decided on for this season, for the reasons already given, are:

VALUATIONS FOR 1903.

In Unmixed or Raw Materials.

For ammonia	13	cents per pound.
For phosphoric acid in acid phosphate	4	cents per pound.
For phosphoric acid in fine bone meal	3	cents per pound.
For phosphoric acid in medium and coarse bone meal	2½	cents per pound.
For potash	5	cents per pound.

In Mixed Fertilizers.

For ammonia	15	cents per pound.
For phosphoric acid	4½	cents per pound.
For potash	5½	cents per pound.

HOW RELATIVE VALUE IS CALCULATED.

In the calculation of relative value, it is only necessary to remember that so many per cent means the same number of pounds per hundred, and that there are twenty hundred in one ton (2,000 pounds).

With an 8—2—2 goods, which means that the fertilizer contains available phosphoric acid 8 per cent, potash 2 per cent, and ammonia 2 per cent, the calculation is made as follows:

Percentage or Lbs. in 100 Lbs.	Value Per 100 Lbs.	Value Per Ton 2,000 Lbs.
8 pounds available phosphoric acid at 4½ cents	0.36×20=	$7.20
2 pounds potash at 5½ cents	0.11×20=	2.20
2 pounds ammonia at 15 cents	0.30×20=	6.00
Total value	0.77×20=	15.40

Freight and merchant's commission must be added to these prices. Freight rates from the seaboard and manufacturing centers to interior points are given in the following table:

Freight Rates from the Seaboard to Interior Points.—From the Published Rates of the Associated Railways of Virginia and the Carolinas. In car-loads of not less than ten tons each, per ton of 2,000 pounds. Less than car-loads, add 20 per cent.

Destination.	From Wilmington, N. C.	From Norfolk and Portsmouth, Va.	From Charleston, S. C.	From Richmond, Va.
Advance	$3.20	$3.20	$3.40	$3.20
Apex	2.70		3.80	3.00
Ashboro	3.20	3.20	3.60	3.20
Asheville	4.00	4.00	4.00	4.00
Chapel Hill	2.95	3.20	3.90	3.20
Charlotte	2.65	3.30	3.20	3.20
Clayton	2.48	2.86	3.63	2.83
Cherryville	2.85	3.60	3.40	3.60
Clinton	1.60	3.00	3.20	3.00
Creedmoor	3.00	3.00	3.80	3.00
Cunningham	3.00	2.40	4.00	2.40
Dallas	3.00	3.60	3.40	3.60
Davidson College	3.00	3.20	3.20	3.20
Dudley	1.70	3.00	3.20	3.00
Dunn	2.00	2.80	3.20	2.80
Durham	2.80	2.83	3.60	2.83
Elkin	3.60	3.20	3.60	3.20
Elm City	2.10	2.60	3.20	2.60
Fair Bluff	1.60	3.80	2.40	3.80
Fayetteville	1.80	3.00	3.00	3.00
Forestville	2.85	3.00	3.80	3.06
Gastonia	3.00	3.56	3.36	3.50
Gibson	2.10	3.50	3.50	3.50
Goldsboro	1.80	2.80	3.20	2.80
Greensboro	2.96	3.00	3.40	3.00
Hamlet	2.00	3.00	3.60	3.00
Henderson	2.95	3.00	3.80	3.00
Hickory	3.20	3.60	3.85	3.60
High Point	3.00	3.08	3.40	3.08
Hillsboro	2.88	2.88	2.68	2.88
Kernersville	3.00	3.00	3.40	3.00
Kinston	2.40	2.50	3.50	2.50
Laurel Hill	1.90	2.40	3.80	3.40
Laurinburg	1.90	3.40	3.80	3.40
Liberty	2.72	3.60	3.80	3.60
Louisburg	2.95	3.00	3.80	3.00
Lumberton	1.60	3.60	3.70	3.60
Macon	3.05	3.00	3.85	3.00
Madison	3.10	3.00	3.00	3.00
Matthews	2.60	3.20	3.20	3.20
Maxton	1.80	3.40	3.00	3.40
Milton	3.44	2.40	4.00	2.40
Mocksville	3.36	3.20	3.40	3.20
Morven	2.55	3.60	2.50	3.60
Mount Airy	2.20	3.40	3.80	3.40
Nashville	2.30	2.90	3.40	2.90
New Bern	1.80	1.75	3.95	1.79
Norwood	3.68	3.20	3.20	2.23
Oxford	3.04	2.83	3.80	2.85
Pineville	2.77	3.25	3.00	3.20
Pittsboro	2.60	3.30	4.10	3.30
Polkton	2.40	3.00	2.20	3.00
Raleigh	2.56	2.83	3.63	2.83
Reidsville	3.00	2.96	3.40	2.36
Rockingham	2.10	3.00	3.80	3.00
Rocky Mount	2.20	2.50	3.40	2.50
Ruffin	3.28	2.80	3.40	2.20
Rural Hall	3.28	3.20	3.60	3.20
Rutherfordton	3.05	3.65	3.40	3.65
Salisbury	3.25	3.20	3.20	3.20
Sanford	2.10	3.00	3.40	3.00
Selma	2.40	2.80	3.20	2.80
Shelby	2.95	3.60	3.40	3.60
Siler City	2.60	3.60	3.80	3.60
Smithfield	2.20	2.80	3.20	2.80
Statesville	3.50	3.20	3.60	3.20
Stem	2.95	2.83	3.80	2.83
Tarboro	2.30	2.40	3.00	2.40
Waco	2.90	3.60	3.40	3.60
Wadesboro	2.30	3.00	2.50	3.00
Walnut Cove	3.12	3.00	3.40	3.00
Warrenton	3.05	3.25	4.10	3.25
Warsaw	1.50	3.00	3.20	3.00
Washington	2.65	1.75	2.25	1.50
Weldon	2.55	1.90	3.85	1.90
Wilson	2.00	2.60	3.20	2.60
Winston-Salem	3.00	3.00	3.40	3.05

ANALYSIS OF COMMERCIAL FERTILIZERS—FALL SEASON, 1902.

Mixed Fertilizers.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value Per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	
	Brands claiming						**8.00**			**2.00**	**1.00**	**$14.30**
2361	American Fertilizer Co., Norfolk, Va.	American Ammoniated Bone	Lexington	R	5.40	3.48	8.88	.42	1.74	2.16	1.67	16.31
2413	Baugh & Sons Co., Norfolk, Va.	Baugh's Double Eagle Phosphate	Statesville	R	3.58	5.21	8.79	.56	1.81	2.37	1.02	16.14
2362	------do	Old Standby Baugh's Raw Bone Superphosphate.	Lexington	R	5.18	3.00	8.18	1.85	1.66	3.51	1.28	19.30
2359	Navassa Guano Co., Wilmington, N. C.	Navassa Complete Fertilizer	------do	R	5.10	4.16	9.26	1.01	1.24	2.25	1.53	16.76
2412	Richmond Guano Co., Richmond, Va.	Bone Mixture	Statesville	R	4.62	3.60	8.22	.58	1.51	2.09	1.75	15.59
2345	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Star Brand Guano.	Durham	S	6.12	3.46	9.58	.61	1.65	2.26	1.32	16.85
2360	------do	Double Owl Brand Guano	Lexington	R	5.30	3.47	8.77	.37	1.88	2.25	1.44	16.23
2347	------do	Durham Ammoniated Fertilizer	Durham	R	5.25	4.01	9.26	.50	1.60	2.10	1.32	16.08
2357	------do	------do	Lexington	R	5.50	4.08	9.58	.48	1.81	2.29	1.24	16.85
2370	------do	Tinsley's Richmond Brand Guano.	Stokesdale	R	4.80	3.60	8.40	.87	1.50	2.37	1.29	16.08
2462	------do	Yadkin Complete Fertilizer	Lincolnton	R	6.35	3.35	9.70	.53	1.24	**1.77**	**.89**	15.02
	Brands claiming						**8.00**			**2.00**	**1.50**	**14.85**
2407	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Crown Brand Ammoniated Fertilizer.	Davidson	R	6.08	2.92	9.00	.22	2.31	2.53	2.02	17.92
2383	American Fertilizer Co., Norfolk, Va.	Peruvian Mixture	Mebane	R	5.32	4.29	9.61	.56	1.70	2.26	2.00	17.62
	Brands claiming						**8.00**			**2.00**	**2.00**	**15.40**
2331	Acme Mfg. Co., Wilmington, N. C.	Acme Special Grain Fertilizer	Walnut Cove	S	5.08	3.33	8.41	.14	1.64	**1.78**	2.21	**15.33**
2510	American Fertilizer Co., Norfolk, Va.	American Cotton Compound	Norwood	D	5.65	3.97	9.62	.76	1.66	2.42	2.63	18.81
2384	------do	Bone and Peruvian Guano	Mebane	R	5.72	3.58	9.30	.64	1.66	2.30	2.46	17.97
2490	------do	------do	Monroe	D	4.70	3.29	**7.99**	.93	1.31	2.24	2.59	16.75
2410	Ashepoo Fertilizer Co., Charleston, S. C.	Carolina Guano	Mooresville	R	6.08	2.91	8.99	1.05	1.06	2.11	2.33	16.98
2319	Baugh & Sons Co., Norfolk, Va.	Baugh's Animal Bone and Potash Compound for all Crops.	Winston	S	5.18	3.92	9.10	.92	1.55	2.47	2.19	18.00
2431	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Eli Ammoniated Fertilizer	Statesville	R	6.18	2.32	8.50	.39	1.89	2.28	2.37	17.10
2427	Columbia Guano Co., Norfolk, Va.	Columbia Soluble Guano	Mt. Olive	R	6.28	2.86	9.14	.96	1.05	2.01	2.16	16.63
2443	Farmers Guano Co., Raleigh, N. C.	State Standard Guano	Liberty	R	5.45	3.25	8.70	.36	1.72	2.08	2.46	16.77
2387	Lynchburg Guano Co., Lynchburg, Va.	Lynchburg Soluble Guano	Graham	R	5.60	3.87	9.47	.10	1.70	**1.80**	**1.84**	15.95
2358	Navassa Guano Co., Wilmington, N. C.	Navassa Grain Fertilizer	Lexington	S	5.88	3.57	9.45	1.02	1.06	2.08	2.36	17.33

2434	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Plow Brand	Hickory	R	5.98	2.77	8.75	.63	1.42	2.05	2.21	16.45
2371	Pocomoke Guano Co., Norfolk, Va.	Pamlico Superphosphate	Stokesdale	R	4.58	4.35	8.93	.78	1.30	2.08	2.03	16.51
2507	Rasin-Monumental Co., Baltimore, Md.	Rasin's Empire Guano	Mooresville	R	4.15	3.16	**7.31**	.56	1.78	2.34	**1.82**	15.60
2385	Richmond Guano Co., Richmond, Va.	Premium Brand Fertilizer	Burlington	R	4.32	5.36	9.68	.45	1.14	**1.59**	2.51	16.24
2346	Royster, F. S., Guano Co., Norfolk, Va.	Farmers Bone Fertilizer	Durham	R	5.60	3.13	8.73	.40	1.56	**1.96**	2.37	16.34
2460	Swift's Fertilizer Works, Atlanta, Ga.	Swift's Golden Harvest Standard Guano.	Marshall	R	5.08	3.27	8.35	.77	1.41	2.18	**1.94**	16.18
2509	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Anchor Brand Fertilizer.	Statesville	R	4.10	3.47	**7.57**	.85	1.55	2.40	2.02	16.23
2428	------do	Eagle Island Ammoniated Guano	Faison	R	5.70	2.84	8.54	.80	1.67	2.47	2.36	17.69
2497	------do	Electric Tobacco Grower	Walnut Cove	D	5.40	4.11	9.51	.95	1.12	2.07	2.00	16.96
2432	------do	Farmers Friend Fertilizer	Hickory	S	4.40	3.56	**7.96**	.69	1.70	2.39	**1.92**	16.45
2489	------do	Genuine Bone & Peruvian Guano	Monroe	N	5.75	2.43	8.18	.90	1.48	2.38	2.01	16.71
2426	------do	Genuine Slaughter House Bone Guano.	Mt. Olive	R	5.10	2.93	8.03	.73	1.32	2.05	2.26	18.19
2395	------do	King Cotton Grower (Blood Goods).	Concord	R	5.42	3.54	8.96	.76	1.49	2.25	2.05	17.06
2461	------do	National Fertilizer	Rutherfordton	R	4.65	2.47	**7.12**	.74	1.86	2.60	**1.86**	16.25
2411	------do	Old Dominion Soluble Guano	Mooresville	R	4.45	4.13	8.58	.81	1.50	2.31	2.14	17.01
2435	------do	Old Dominion Special Wheat Guano.	Morganton	R	4.42	4.22	8.64	.51	1.67	2.18	**1.91**	16.50
2386	------do	Owl Brand Guano	Burlington	R	7.15	1.26	8.41	.51	1.70	2.21	**1.98**	16.37
2423	------do	Tinsley's Stonewall Guano	Mt. Olive	S	5.35	2.78	8.13	1.19	1.41	2.60	2.09	17.41
2500	------do	Winston's Special for Cotton	Fair Bluff	D	5.70	2.35	8.05	.61	1.78	2.39	3.42	18.18
2408	Virginia State Fertilizer Co., Lynchburg, Va.	Virginia State High Grade Guano.	Davidson	R	5.12	4.04	9.16	.73	1.51	2.24	2.11	17.28
	Brands claiming						**8.00**			**2.50**	**1.50**	**16.35**
2444	Va.-Car. Chemical Co., Richmond, Va.	Charlotte Ammoniated Fertilizer	Siler City	D	5.12	3.39	8.51	.66	2.41	3.07	1.79	18.83
2399	------do	----do	Charlotte	R	5.25	3.47	8.72	1.39	1.51	2.90	1.97	19.61
	Brand claiming						**8.00**			**2.50**	**2.00**	**16.90**
2477	Navassa Guano Co., Wilmington, N. C.	Ammoniated Soluble Navassa Guano.	Wallace	R	4.40	3.48	**7.88**	.70	2.06	2.76	2.10	17.68
	Brands claiming						**8.00**			**2.00**	**3.00**	**16.50**
2491	Read Phosphate Co., Charleston, S. C.	Read's Tobacco Leaf	Monroe	R	6.32	2.71	9.03	.44	1.83	2.27	3.16	18.41
2482	Pocomoke Guano Co., Norfolk, Va.	Crescent Complete Compound	Wilmington	R	3.68	5.01	8.69	.83	1.55	2.38	3.04	18.30
	Brands claiming						**8.00**			**2.50**	**3.00**	**18.00**
2433	Royster, F. S., Guano Co., Norfolk, Va.	Orinoco Tobacco Guano	Hickory	R	5.92	3.02	8.94	1.00	1.63	2.63	**2.68**	18.88
2424	Va.-Car. Chemical Co., Richmond, Va.	Killikinnick Tobacco Mixture	Mt. Olive	R	4.95	3.86	8.81	1.26	1.33	2.59	3.28	19.30
2454	------do	North Carolina Official Farmers' Alliance Guano.	Gastonia	R	5.22	2.83	8.05	.40	2.11	2.51	**2.96**	18.03
	Brand claiming						**8.00**			**3.00**	**2.00**	**18.40**
2479	Navassa Guano Co., Wilmington, N. C.	Navassa Cotton-seed Meal Special 3 Per Cent Guano.	Teachey's	N	5.25	3.60	8.85	.27	3.27	3.54	2.07	20.86
	Brand claiming						**8.00**			**3.00**	**2.50**	**18.95**
2421	Acme Mfg. Co., Wilmington, N. C.	Acme Fertilizer	Mt. Olive	R	4.62	2.94	7.56	.55	2.78	3.33	2.54	19.59
	Brands claiming						**8.00**			**3.00**	**3.00**	**19.50**
2449	American Fert. Co., Norfolk, Va.	American Eagle Guano	Wadesboro	D	5.62	2.55	8.17	.79	2.37	3.16	**2.97**	20.69

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—FALL SEASON, 1902—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value Per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	
				MIXED FERTILIZERS.								
2483	Baugh & Sons Co., Norfolk, Va.	Grand Rapid Guano	Wilmington	R	5.02	3.66	8.68	1.89	1.55	3.44	3.20	$ 21.65
2420	Pocomoke Guano Co., Norfolk, Va.	Monarch Tobacco Grower	Dudley	R	6.32	2.65	8.97	1.53	1.72	3.25	3.65	21.83
2425	Va.-Car. Chemical Co., Richmond, Va.	Bright Leaf Tobacco Grower	Mt. Olive	R	3.75	2.94	**6.69**	.58	2.05	**2.63**	**2.76**	**16.95**
	Brand claiming						**8.00**			**4.00**	**4.00**	**23.60**
2478	Navassa Guano Co., Wilmington, N. C.	Navassa Special Truck Guano	Wallace	R	5.90	2.50	8.40	1.57	1.76	**3.33**	**3.88**	**21.81**
	Brand claiming						**8.00**			**4.50**	**4.00**	**25.10**
2501	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Star Brand Vegetable Guano.	Cerro Gordo	D	5.90	2.34	8.24	.93	3.33	**4.26**	**3.22**	**23.74**
	Brand claiming						**8.00**			**3.00**	**10.00**	**27.20**
2481	Baugh & Sons Co., Norfolk, Va.	Baugh's Fruit and Berry Guano	Wilmington	R	7.08	2.45	9.53	2.24	1.13	3.37	**9.73**	29.39
	Brand claiming						**8.50**			**2.00**	**2.00**	**15.85**
2372	Pocomoke Guano Co., Norfolk, Va.	Electric Crop Grower	Stokesdale	R	4.55	4.53	9.08	.92	1.24	2.16	2.03	16.88
	Brands claiming						**9.00**			**2.25**	**1.00**	**15.95**
2398	Bradley Fertilizer Co., Boston, Mass.	Sea Fowl Guano	Charlotte	R	7.22	3.22	10.44	1.30	1.40	2.70	1.54	19.19
2508	Quinnipiac Co., New York, N. Y.	Quinnipiac Pine Island Ammoniated Phosphate.	Mooresville	D	8.38	4.93	13.31	.49	1.88	2.37	1.29	20.50
	Brands claiming						**9.00**			**2.00**	**2.00**	**16.30**
2397	Ober, G., & Sons Co., Baltimore, Md.	Ober's Special Ammoniated Dissolved Bone.	Concord	S	9.45	1.78	11.23	.70	1.70	2.40	2.10	19.62
2409	Etiwan Fertilizer Co., Charleston, S. C.	Plow Brand Ammoniated Dissolved Bone.	Mooresville	R	8.32	2.36	10.68	.80	1.24	2.04	2.14	18.09
	Brand claiming						**9.25**			**2.50**	**2.00**	**18.02**
2475	Patapsco Guano Co., Baltimore, Md.	Patapsco Guano	Faison	D	6.55	3.55	10.10	.71	1.87	2.58	3.31	20.47
	Brand claiming						**9.00**			**2.25**	**4.00**	**19.25**
2332	Pocomoke Guano Co., Norfolk, Va.	Monticello Animal Bone Fertilizer.	Pilot Mountain	R	8.22	3.83	12.05	.77	1.88	2.65	4.00	23.19
	Brand claiming						**11.00**			**3.00**	**4.00**	**23.30**
2406	Va.-Car. Chemical Co., Richmond, Va.	Oliver's Perfect Wheat Grower	Charlotte	R	9.22	3.86	13.08	2.68	.41	3.09	**3.95**	25.39
	Brand claiming						**6.00**			**4.00**	**4.00**	**21.80**
2422	Va.-Car. Chemical Co., Richmond, Va.	Tinsley's Strawberry Grower	Mt. Olive	R	2.38	3.64	6.02	1.89	2.13	4.02	4.05	21.93
	Brand claiming						**6.00**			**4.00**	**8.00**	**26.20**
2480	Acme Mfg. Co., Wilmington, N. C.	Acme Truck Grower	Wilmington	R	3.32	2.63	**5.95**	1.07	2.51	**3.58**	**5.97**	**22.66**

	Brand claiming						**6.00**			**5.00**	**7.00**	**28.10**
2476	Baugh & Sons Co., Norfolk, Va.	Baugh's Peruvian Guano Substitute.	Wallace	R	3.18	3.30	6.48	2.86	2.24	5.10	7.16	29.01
	Brand claiming						**8.00**				**2.00**	**9.40**
2374	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Registered Bone and Potash Mixture.	Thomasville	S	4.88	3.66	8.54				1.89	9.76
	Brands claiming						**8.00**				**2.25**	**9.67**
2335	Navassa Guano Co., Wilmington, N. C.	Warlick's Mixture	Mt. Airy	S	5.50	3.96	9.46				2.34	11.08
2388	Va.-Car. Chem. Co., Richmond, Va.	Allison & Addison's McGavock's Special Potash Mixture.	Burlington	R	3.35	4.87	8.22				**2.00**	**9.59**
	Brands claiming						**8.00**				**3.00**	**10.50**
2445	Navassa Guano Co., Wilmington, N. C.	Harvey's Bone and Potash	Siler City	D	4.75	4.36	9.11				**2.71**	11.18
2401	Va.-Car. Chem. Co., Richmond, Va.	McCrary's Dissolved Bone and Potash.	Concord	R	5.32	6.66	11.98				3.51	14.64
	Brands claiming						**8.00**				**4.00**	**11.60**
2390	Va.-Car. Chem. Co., Richmond, Va.	Carr's Special Wheat Grower	Graham	R	4.58	4.37	8.95				**3.96**	12.41
2337	------do	Carr's Special Wheat Grower	Mt. Airy	R	5.25	3.73	8.98				**3.91**	12.38
2437	------do	Miller's Special Wheat Mixture	Morganton	R	4.12	4.16	8.28				4.56	12.47
2464	------do	Travers' Special Wheat Compound.	Hendersonville	R	2.50	6.47	8.97				**3.39**	11.80
2451	Richmond Guano Co., Richmond, Va.	Tip-Top Bone and Potash Fertilizer.	Monroe	R	2.25	6.41	8.66				**3.70**	11.86
	Brands claiming						**8.50**				**2.00**	**9.85**
2498	Navassa Guano Co., Wilmington, N. C.	Navassa Bone and Potash	Mt. Airy	D	4.30	4.88	9.18				2.14	10.62
2336	Va.-Car. Chem. Co., Richmond, Va.	Old Dominion Dissolved Bone and Potash.	----do	R	4.75	4.21	8.96				**1.82**	10.06
2414	Va. State Fert. Co., Lynchburg, Va.	Gilt-Edge Dissolved Bone and Potash.	Davidson	R	4.40	4.50	8.90				**1.88**	10.07
	Brand claiming						**10.00**				**1.50**	**10.65**
2340	Va.-Car. Chem. Co., Richmond, Va.	Great Wheat and Corn Grower	Pilot Mountain	R	5.58	4.17	**9.75**				2.32	11.33
	Brands claiming						**10.00**				**2.00**	**11.20**
2333	Acme Mfg. Co., Wilmington, N. C.	Bone and Potash	Walnut Cove	S	5.15	3.68	**8.83**				2.24	**10.40**
2348	American Fert. Co., Norfolk, Va.	Dissolved Bone and Potash for Corn and Wheat.	Mebane	R	7.62	2.98	10.60				2.32	12.09
2364	------do	----do	Lexington	R	7.15	3.30	10.45				2.51	12.16
2502	Baugh & Sons Co., Norfolk, Va.	Baugh's Soluble Alkaline Superphosphate.	Roxboro	D	2.50	7.71	10.21				2.16	11.56
2351	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Electric Bone and Potash Mixture.	Hillsboro	R	4.62	6.00	10.62				2.25	12.03
2324	------do	Electric Fertilizer	Winston	R	5.70	4.91	10.61				2.22	11.99
2349	Columbia Guano Co., Norfolk, Va.	Columbia Bone and Potash	Hillsboro	S	5.55	4.61	10.16				1.79	11.11
	Brands claiming						**10.00**				**2.00**	**11.20**
2505	Farmers Guano Co., Norfolk, Va.	Century Bone and Potash	Elon College	D	6.62	5.41	12.03				1.70	12.70
2468	Lynchburg Guano Co., Lynchburg, Va.	Lynchburg Dissolved Bone and Potash.	Cherryville	R	6.28	5.45	11.73				**1.65**	12.37
2321	Navassa Guano Co., Wilmington, N. C.	Navassa Dissolved Bone with Potash.	Winston	R	6.50	5.01	11.01				2.00	12.10

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—FALL SEASON, 1902—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
				MIXED FERTILIZERS.								
2511	Read Phosphate Co., Charleston, S. C.	Read's Bone and Potash	Albemarle	D	7.22	2.89	10.11				2.19	$ 11.50
2339	Richmond Guano Co., Richmond, Va.	Bone and Potash Mixture	Stokesdale	R	4.50	7.14	11.64				**1.81**	12.47
2389	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Bone and Potash Mixture.	Mebane	R	7.10	3.00	10.10				2.70	12.06
2450	Swift's Fertilizer Works, Atlanta, Ga.	Swift's Wheat Grower and Standard Grade Bone and Potash.	Wadesboro	D	5.52	6.35	11.88				**1.52**	12.36
2320	Va.-Car. Chem. Co., Richmond, Va.	Alkaline Bone and Potash	Winston	R	5.82	4.79	10.61				2.43	12.22
2363	------do	Allison & Addison's B. P. Potash Mixture.	Lexington	R	5.10	4.25	**9.35**				2.49	**11.15**
2400	------do	Blue Ridge Wheat Grower	Salisbury	R	5.25	4.80	10.05				2.17	11.43
2463	------do	Capital Bone and Potash Compound.	Marshall	R	3.72	7.03	10.75				**1.55**	11.38
2391	------do	Dissolved Bone and Potash	Graham	R	6.70	4.56	11.26				**1.60**	11.89
2492	------do	Durham Bone and Potash Mixture.	Gastonia	R	10.45	3.38	13.83				**1.88**	14.51
2416	------do	Eureka Bone and Potash Compound.	Statesville	R	5.42	3.39	**8.81**				2.38	**10.54**
2486	------do	Mammoth Wheat and Grass Grower.	Troy	D	6.52	4.22	10.74				**1.67**	11.50
2322	------do	Owl Brand Acid Phosphate with Potash.	Winston	R	5.80	4.79	10.59				2.06	11.79
2436	------do	Standard Wheat Grower	Statesville	R	7.25	3.89	11.17				**1.78**	12.01
2465	------do	Ten-two Bone and Potash	Rutherfordton	R	6.62	4.21	10.81				2.23	12.18
2350	------do	Winston Bone and Potash Compound.	Hillsboro	R	6.62	4.25	10.87				2.09	12.08
	Brand claiming						**10.00**				**2.26**	**11.47**
2467	Navassa Guano Co., Wilmington, N. C.	Navassa Wheat Mixture	Forest City	D	3.85	6.15	10.00				2.26	11.49
	Brands claiming						**10.00**				**3.00**	**12.30**
2499	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Morris & Scarboro's Special Bone and Potash Mixture for Wheat.	Mt. Airy	D	6.60	4.40	11.00				3.40	13.64
2373	Va.-Car. Chem. Co., Richmond, Va.	Finch & Harris' Special Bone and Potash for Wheat and Clover.	Thomasville	R	4.90	5.75	10.65				**2.78**	12.64

2488	------do	Farmers' Pride Bone and Potash Mixture.	Siler City	D	5.78	4.97	10.75				3.15	13.13
	Brands claiming						**10.00**				**4.00**	**13.40**
2334	Acme Mfg. Co., Wilmington, N. C.	Acme Bone and Potash	Walnut Cove	S	5.90	3.85	**9.75**				**3.39**	**12.50**
2512	American Fert. Co., Norfolk, Va.	Double Dissolved Bone and Potash.	Norwood	N	6.65	3.74	10.39				**3.45**	**13.14**
2415	Navassa Guano Co., Wilmington, N. C.	Navassa Wheat and Grass Grower.	Statesville	R	5.60	4.73	10.33				**3.61**	**13.27**
2485	Swift's Fert. Works, Atlanta, Ga.	Swift's Homestead High Grade Phosphate and Potash.	Biscoe	D	6.17	4.56	10.73				4.34	14.43
2487	Va.-Car. Chem. Co., Richmond, Va.	Va.-Car. C. Co.'s Special Potash Mixture.	Bear's Creek	N	6.18	4.05	10.23				4.07	13.68
2466	Va. State Fert. Co., Lynchburg, Va.	XX Potash Mixture	Lattimore	D	6.45	5.40	11.85				**3.28**	14.26
	Brand claiming						**11.00**				**2.00**	**12.10**
2338	Pocomoke Guano Co., Norfolk, Va.	Alkali Bone	Pilot Mountain	R	5.50	5.82	11.32				**1.97**	12.35
	Brand claiming						**12.00**				**3.00**	**14.10**
2504	Va.-Car. Chem. Co., Richmond, Va.	Reaper Grain Application	Gibsonville	R	6.75	5.26	12.01				3.33	14.47
	Brand claiming						**13.00**			**2.50**		**19.20**
2330	Baugh & Sons Co., Norfolk, Va.	Baugh's Pure Dissolved Animal Bone.	Winston	S	1.48	14.80	16.28	1.91	.96	2.87		23.26

Raw or Unmixed Fertilizer Materials.

	Brands claiming						**10.00**					**8.00**
2368	American Fert. Co., Norfolk, Va.	American Acid Phosphate	Lexington	D	5.95	4.41	10.36					8.28
2343	Navassa Guano Co., Wilmington, N. C.	Croatan Acid Phosphate	Mt. Airy	R	5.90	6.00	11.90					9.52
2342	Richmond Guano Co., Richmond, Va.	Old Homestead Dissolved Bone	Pilot Mountain	R	4.55	6.41	10.96					8.76
2341	Va.-Car. Chem. Co., Richmond, Va.	Durham Acid Phosphate	Pilot Mountain	R	5.92	5.33	11.25					9.00
2459	------do	Horseshoe Brand Acid Phosphate	Steeds	R	5.58	5.00	10.58					8.46
2325	------do	Norfolk Soluble Bone	Winston	R	4.90	5.94	10.84					8.67
2471	------do	Owl Brand Acid Phosphate	Rutherfordton	R	7.82	6.10	13.92					11.13
	Brands claiming						**12.00**					**9.60**
2327	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Staple Acid Phosphate	Winston	R	7.68	7.60	15.20					12.16
2515	Columbia Guano Co., Norfolk, Va.	Columbia Acid Phosphate	Albemarle	R	6.00	6.07	12.07					9.66
2552	Navassa Guano Co., Wilmington, N. C.	Navassa Acid Phosphate	Lumberton	N	10.42	4.57	14.99					11.99
2403	Powhatan Chem. Co., Richmond, Va.	Virginia Dissolved Bone	China Grove	R	6.05	8.26	14.31					11.45
	Brands claiming						**12.00**					**9.60**
2514	Richmond Guano Co., Richmond, Va.	Dissolved S. C. Phosphate	Albemarle	D	5.90	6.63	12.53					10.02
2381	Royster, F. S., Guano Co., Norfolk, Va.	Royster's XX Acid Phosphate	Thomasville	R	7.75	4.13	**11.88**					**9.50**
2328	Va.-Car. Chemical Co., Richmond, Va.	Capital Dissolved S. C. Bone	Centreville	R	8.68	5.33	14.01					11.20
2446	------do	Charlotte Dissolved Bone	Siler City	N	7.45	4.85	12.30					9.84
2438	------do	Our Acid Phosphate	Statesville	N	9.88	4.23	14.11					11.28
2394	------do	Royster's High Grade Acid Phosphate.	Burlington	R	4.08	6.79	**10.87**					**8.69**

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ANALYSES OF COMMERCIAL FERTILIZERS—FALL SEASON, 1902—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value Per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	
	RAW OR UNMIXED FERTILIZER MATERIALS.											
2329	Va-Car. Chemical Co., Richmond, Va.	Tar Heel Acid Phosphate.	Waughtown	R	8.02	5.57	13.59					$ 10.87
	Brands claiming						**13.00**					**10.40**
2448	Acme Mfg. Co., Wilmington, N. C.	Acme Acid Phosphate	Greensboro	N	8.62	4.58	13.20					10.56
2356	American Fertilizer Co., Norfolk, Va.	Eagle High Grade Acid Phosphate.	Mebane	R	11.75	3.15	14.90					11.92
2455	Ashepoo Fertilizer Co., Charleston, S. C.	Ashepoo XXX Acid Phosphate	Charlotte	D	11.00	4.48	15.48					12.38
2379	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Sterling Fertilizer	Thomasville	R	7.72	5.88	13.60					10.88
2402	Columbia Guano Co., Norfolk, Va.	Columbia Dissolved Bone	Salisbury	R	9.35	3.84	13.19					10.55
2326	Etiwan Fertilizer Co., Charleston, S. C.	Diamond Soluble Bone	Winston	R	10.62	3.24	13.86					11.08
2378	Farmers Guano Co., Raleigh, N. C.	Farmers High Grade Acid Phosphate.	Lexington	R	8.85	4.42	13.27					10.61
2472	Lynchburg Guano Co., Lynchburg, Va.	Arvonia Acid Phosphate	Cherryville	N	7.08	7.00	14.08					11.26
2367	Navassa Guano Co., Wilmington, N. C.	Navassa High Grade Dissolved Bone.	Lexington	R	8.58	6.25	14.83					11.86
2375	Richmond Guano Co., Richmond, Va.	Premium Dissolved Bone	Stokesdale	R	6.55	6.56	13.11					10.48
2380	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Dissolved Bone	Thomasville	R	10.42	2.65	13.07					10.45
2365	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's I X L Acid Phosphate.	Lexington	R	9.08	5.68	14.76					11.80
2456	------do	Charlotte Acid Phosphate	Charlotte	R	9.25	4.45	13.70					10.96
2470	------do	Dissolved S. C. Bone	Rutherfordton	R	9.95	4.25	14.20					11.36
2353	------do	Double Bone Phosphate—Extra Strong.	Hillsboro	R	6.50	6.96	13.46					10.76
2513	------do	Norfolk Best Acid Phosphate	Elkin	D	7.08	5.92	13.00					10.40
2442	------do	Old Dominion High Grade Bone Phosphate.	Morganton	R	9.02	4.19	13.21					10.56
2366	------do	Owl Brand High Grade Acid Phosphate.	Lexington	R	7.58	6.73	14.31					11.44
2439	------do	Standard High Grade Acid Phosphate.	Statesville	N	6.20	4.51	13.71					10.96
2429	------do	Tinsley's Dissolved S. C. Bone	Mt. Olive	D	9.82	4.14	13.96					11.16
2405	------do	Victor High Grade Acid Phosphate.	China Grove	R	9.42	3.58	13.00					10.40

2477	Va. State Fertilizer Co., Lynchburg, Va.	Clipper Brand Acid Phosphate	Lexington	R	8.60	6.95	15.55						12.44
							14.00						**11.20**
	Brands claiming												11.24
2516	Acme Mfg. Co., Wilmington, N. C.	Acme Acid Phosphate	Greensboro	N	13.10	.95	14.05						11.84
2369	American Fertilizer Co., Norfolk, Va.	High Grade Acid Phosphate	Lexington	D	11.15	3.66	14.81						12.30
2376	Baugh & Sons Co., Norfolk, Va.	Baugh's High Grade Acid Phosphate.	High Point	R	9.75	5.71	15.46						11.53
2354	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Climax Dissolved Bone	Hillsboro	R	8.00	6.42	14.42						12.17
2352	Columbia Guano Co., Norfolk, Va.	Columbia 14 Per Cent Acid Phosphate.	----do	R	12.78	2.44	15.22						13.02
2469	Lynchburg Guano Co., Lynchburg, Va.	Lynchburg High Grade Acid Phosphate.	Shelby	D	9.90	6.38	16.28						13.09
2355	Pocahontas Guano Co., Lynchburg, Va.	Imperial Dissolved S. C. Phosphate.	Hillsboro	R	11.05	5.32	16.37						11.40
2440	Pocomoke Guano Co., Norfolk, Va.	Peerless Acid Phosphate	Statesville	N	9.15	5.11	14.26						11.93
2493	Richmond Guano Co., Richmond, Va.	High Grade Acid Phosphate	Gastonia	N	7.08	7.84	14.92						11.42
2441	Royster, F. S., Guano Co., Norfolk, Va.	Royster's High Grade 14 Per Cent Acid Phosphate.	Hickory	R	8.95	5.33	14.28						11.34
2458	Swift Fertilizer Works, Atlanta, Ga.	Swift's Cultivator High Grade Phosphate.	Biscoe	R	8.62	5.56	14.18						11.58
2517	------do	----do	Charlotte	N	9.42	5.05	14.47						**10.54**
2447	Va.-Car. Chem. Co., Richmond, Va.	Allison & Addison's Fulton Acid Phosphate.	Greensboro	D	6.18	6.98	**13.16**						11.50
2473	------do	Durham Excelsior Dissolved Bone Phosphate.	Cherryville	N	11.28	3.10	14.38						11.63
2474	------do	Red Cross 14 Per Cent Acid Phosphate.	Lincolnton	D	11.40	3.14	14.54						11.44
2484	------do	Tinsley's Powhatan High Grade Phosphate.	Rose Hill	N	10.75	3.55	14.30						12.07
2506	------do	Travers' Dissolved Bone Phosphate.	Roxboro	D	8.38	6.71	15.09						**10.93**
2494	------do	V.-C. C. Co.'s 14 Per Cent Acid Phosphate.	Marshville	N	10.90	2.76	**13.66**						**12.00**
							15.00						13.27
	Brand claiming												**12.80**
2417	Va.-Car. Chemical Co., Richmond, Va.	Charlotte Acid Phosphate	Charlotte	R	9.32	7.27	16.59						13.32
	Brand claiming						**16.00**						**12.80**
2418	Columbia Guano Co., Norfolk, Va.	Columbia High Grade 16 Per Cent Acid Phosphate.	Davidson	R	14.20	2.45	16.65						14.56
							16.00						13.27
	Brands claiming												14.53
2393	Lynchburg Guano Co., Lynchburg, Va.	Ironside Acid Phosphate	Graham	D	12.40	5.80	18.20						**12.00**
2404	Va.-Car. Chemical Co., Richmond, Va.	Comet Acid Phosphate	China Grove	R	10.65	5.94	16.59						**11.78**
2392	Va. State Fertilizer Co., Lynchburg, Va.	Bull Run Acid Phosphate	Burlington	D	11.32	6.85	18.17						12.22
	Brands claiming												**11.84**
2495	Ashepoo Fertilizer Co., Charleston, S. C.	German Kainit	Charlotte	S									**11.82**
2453	Calder Bros., Wilmington, N. C.	Genuine German Kainit	Wadesboro	S									
2496	Columbia Guano Co., Norfolk, Va.	---do	Marshville	R									
2430	Va.-Car. Chemical Co., Richmond, Va.	---do	Mt. Olive	S									

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—FALL SEASON, 1902—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value Per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	
RAW OR UNMIXED FERTILIZER MATERIALS.												
	Brands claiming									**3.50**		$
2382	Jamestown Bone Meal Co., Jamestown, N. C.	Beeson Hardware Co.	High Point	S				.24	4.86	5.10		*25.38
2344	Va.-Car. Chemical Co., Richmond, Va.	Shin-Bone Meal	Pilot Mountain	D				.49	3.18	3.67		†25.73

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

*Total Phosphoric Acid found 20.20 per cent, valued in Bone Meal at three cents per pound.
†Total Phosphoric Acid found 26.98.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	Relative Value. Per Ton at Factory.
					MIXED FERTILIZERS.										
	Brands claiming						**8.00**			**2.00**	**1.00**				**$14.30**
2535	American Agricultural Chemical Co., New York.	Zell's Ammoniated Bone Superphosphate.	Edenton	R	4.50	4.62	9.12	.68	1.71	2.39	2.14				17.73
3058	------do	----do	Edenton	R	5.10	3.30	8.40	.52	1.59	2.11	**.95**				14.94
2548	Baugh & Sons Co., Norfolk, Va.	Old Stand-By Baugh's Raw Bone Superphosphate.	Wilmington	R	5.05	3.43	8.48	.88	1.70	2.58	1.19				16.67
2838	------do	Baugh's Double Eagle Phosphate.	Chapanoke	R	5.98	2.68	8.66	.65	1.72	2.37	1.56				16.62
2568	Columbia Guano Co., Norfolk, Va.	Carolina Soluble Guano	Edenton	R	5.45	2.99	8.44	.54	1.76	2.30	1.07				15.67
2898	Hampton Guano Co., Norfolk, Va.	Hampton Ammoniated Superphosphate.	Hertford	R	5.12	3.49	8.61	.48	1.62	2.10	1.00				15.15
2881	Navassa Guano Co., Wilmington, N. C.	Navassa Complete Fertilizer	Forest City	R	6.00	2.88	8.88	1.02	1.23	2.25	1.02				15.86
3013	Parker & Hunt, Oxford, N. C.	Blood and Bone Mixture	Oxford	S	6.36	3.09	9.45	.72	1.28	2.00	1.36				16.00
2961	Powhatan Chemical Co., Richmond, Va.	Magic Ammoniated Phosphate	Semora	S	5.42	3.05	8.47	.39	2.08	2.47	2.00				17.23
3097	------do	----do	Siloam	R	5.25	3.60	8.85	.39	1.28	**1.67**	1.95				15.12
2706	Rasin Monumental Co., Baltimore, Md.	Rasin's Dixie Guano	Edenton	R	5.50	2.50	8.00	.49	1.56	2.05	1.04				14.49
3006	Reidsville Fertilizer Co., Reidsville, N. C.	Banner Fertilizer	Pilot Mountain	D	4.71	3.42	8.13	.31	1.87	2.18	1.66				15.68
3089	Richmond Guano Co., Richmond, Va.	Bone Mixture	Wilkesboro	R	5.67	4.20	9.87	.70	1.02	**1.72**	1.31				15.45
2752	------do	----do	Dunn	R	5.35	3.30	8.65	.71	1.12	**1.83**	1.48				14.90
2751	Royster, F. S., Guano Co., Norfolk, Va.	Caledonia Mixture	Dunn	D	6.12	1.88	8.00	.83	.99	**1.82**	1.66				14.49
2693	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Star Brand Guano.	Seagrove	R	6.18	3.03	9.21	.43	1.35	**1.78**	1.04				14.77
2830	------do	----do	Raleigh	R	5.68	3.07	8.75	1.05	1.12	2.17	1.03				15.52

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1903—CONTINUED.

MIXED FERTILIZERS.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value Per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
2613	Va.-Car. Chemical Co., Richmond, Va.	Beef Blood and Bone Fertilizer	Faison	D	7.08	.62	8.80	.58	1.48	2.06	1.36	----	----	----	$ 15.60
2793	------do	Durham Ammoniated Fertilizer	Durham	D	5.75	2.33	8.08	.83	1.30	2.13	1.17	----	----	----	14.95
2839	------do	North State Guano	Graham	R	5.72	2.58	8.30	.96	1.76	2.72	1.22	----	----	----	16.97
2604	------do	Orient Complete Manure	Elizabeth City	D	5.80	2.58	8.38	.83	1.48	2.31	1.25	----	----	----	15.85
3077	------do	------do	Elizabeth City	R	5.47	2.66	8.13	.45	1.84	2.29	1.10	----	----	----	15.40
2916	------do	Progressive Farmer Guano	Burgaw	D	5.55	2.63	8.18	.93	.82	**1.75**	1.50	----	----	----	**14.26**
2795	------do	Queen of the Harvest	Hillsboro	S	3.75	3.33	9.08	.84	1.42	2.26	1.26	----	----	----	16.34
2758	------do	Stonewall Soluble Guano	Autreyville	D	6.30	2.13	8.43	.86	.82	**1.68**	2.34	----	----	----	15.20
2732	------do	Tinsley's Richmond Brand Guano.	Winfall	R	5.50	2.43	**7.93**	.87	1.14	2.01	1.42	----	----	----	14.73
2768	------do	Yadkin Complete Fertilizer	Chapel Hill	R	4.52	2.96	**7.48**	.88	1.13	2.01	1.12	----	----	----	**13.97**
2851	------do	Vinco Guano	Roxboro	R	5.45	3.06	8.51	.69	1.52	2.21	**.93**	----	----	----	15.31
3011	Virginia State Fertilizer Co., Lynchburg, Va.	Highland King	Burlington	S	4.35	5.10	9.45	1.24	.89	2.13	1.11	----	----	----	16.12
	Brand claiming						**8.00**			**2.00**	**1.50**	----	----	----	**14.85**
2666	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Crown Brand Ammoniated Guano.	Wake Forest	R	6.25	2.17	8.42	.72	1.86	2.58	2.00	----	----	----	17.52
	Brands claiming						**8.00**			**2.50**	**1.00**	----	----	----	**15.80**
2889	Va.-Car. Chemical Co., Richmond, Va.	Capital Cotton Fertilizer	Vineland	R	6.75	2.19	8.94	1.22	1.08	**2.30**	1.21	----	----	----	16.28
2722	------do	Gibbs' High Grade Ammoniated Guano.	Princeton	D	5.62	2.38	8.00	1.16	1.53	2.69	1.35	----	----	----	16.76
	Brands claiming						**8.00**			**2.00**	**2.00**	----	----	----	**15.40**
2728	American Agricultural Chemical Co., New York, N. Y.	Canton Chemical Game Guano	Beverly	R	6.50	2.09	8.59	1.18	1.23	2.41	2.19	----	----	----	17.37
2745	------do	Orient Guano	Littleton	R	5.80	2.60	8.40	.32	1.78	2.10	2.00	----	----	----	16.06
3063	------do	Purity Guano	Edenton	R	5.10	2.95	8.05	1.40	.84	2.24	2.03	----	----	----	16.20
2585	------do	Triumph Soluble Guano	Roper	R	5.52	3.68	9.20	.74	1.64	2.38	2.10	----	----	----	17.73
2764	------do	------do	Aulander	R	7.00	1.67	8.67	.69	1.36	2.05	1.98	----	----	----	16.13
2909	American Fertilizer Co., Norfolk, Va.	A. L. Hannah's Special Formula Guano.	Reidsville	R	6.20	2.05	8.25	.55	1.70	2.25	2.66	----	----	----	17.10
2764	------do	American Cotton Compound	Norwood	R	6.08	2.14	8.22	2.84	.70	3.54	2.55	----	----	----	20.32

2677	------do	Bone and Peruvian Guano	New Bern	R	5.00	2.18	**7.18**	.28	1.92	2.20	2.71				16.04
		----do	Warrenton	R	6.02	2.48	8.50	1.05	.96	2.11	2.06				16.25
2744	------do	----do	Shelby	S	6.92	1.92	8.84	.27	1.82	2.09	**1.62**				16.01
2990	------do	----do	Elizabeth City	S	5.48	2.70	8.18	.34	1.68	2.02	2.20				14.84
2681	Armour Fertilizer Works, Baltimore, Md.	Armour's General Fertilizer	Edenton	S	6.30	2.20	8.50	.29	1.80	2.09	2.30				16.45
2564	Arps, G. L. & Co., Norfolk, Va.	High Grade Premium Guano	Edenton	R	5.30	2.97	8.27	.62	1.26	**1.88**	2.20				15.50
3085	------do	----do	Mooresville	R	5.60	4.38	9.98	.89	1.20	2.09	2.31				17.79
2927	Ashepoo Fertilizer Co., Charleston, S. C.	Carolina Guano	Mt. Olive	R	6.58	1.48	8.06	.73	1.41	2.14	2.17				16.06
2638	Atlantic Chemical Co., Norfolk, Va.	Atlantic Soluble Guano	Mackey's Ferry	S	2.50	6.51	9.01	1.24	.44	**1.68**	2.53				15.93
2583	Baltimore Pulverizing Co., Baltimore, Md.	Premium Cotton Fertilizer	Washington	R	5.15	3.61	8.76	.55	1.68	2.23	2.05				17.23
2521	Baugh & Sons Co., Norfolk, Va.	Baugh's Animal Bone and Potash Compound for all Crops.	Concord	R	5.45	3.06	8.51	.47	1.55	2.02	2.13				16.06
3070	------ do	----do	Edenton	R	6.30	2.38	8.68	.63	2.12	2.75	2.82				19.16
2605	------do	Baugh's Fish Mixture	Star	R	6.50	2.11	8.61	.51	1.56	2.07	2.28				16.46
2695	Berkley Chemical Co., Norfolk, Va.	Brandon Superphosphate	Washington	R	7.88	1.70	9.58	.46	1.56	2.02	2.18				17.08
2702	Bragaw, Wm. & Co., Washington, N. C.	Old Reliable Premium	Wake Forest	R	6.68	1.40	8.08	.76	1.70	2.46	2.00				16.85
2667	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Eli Ammoniated Fertilizer	Raleigh	D	6.25	1.83	8.08	.53	1.61	2.14	2.37				16.29
2823	------do	----do	Tarboro	R	6.08	2.12	8.20	.74	1.58	2.32	2.12				16.67
2526	Columbia Guano Co., Norfolk, Va.	Columbia Soluble Guano	Edenton	S	4.50	3.63	8.13	.64	1.36	2.00	**1.89**				15.40
3062	------do	----do	Mt. Olive	D	8.25	2.23	10.48	.31	1.73	2.04	2.04				17.79
2623	Farmers Guano Co., Raleigh, N.C.	State Standard Guano	Icara	R	6.15	2.15	8.30	.44	2.26	2.70	2.20				17.99
2935	Griffith & Boyd, Baltimore, Md.	High Grade Triumph Guano	Wilson	R	6.75	1.95	8.70	1.88	------	**1.88**	2.01				15.68
3028	Hadley, J. C. & Co., Wilson, N.C.	John Hadley's Special High Grade Plant Food.	Mebane	R	5.68	2.63	8.31	.75	1.47	2.22	2.17				16.53
2849	Hampton Guano Co., Norfolk, Va.	Shirley Superphosphate	Edenton	S	5.15	4.52	9.67	.55	1.77	2.32	2.20				18.08
2559	Harrell, S. B. & Co., Norfolk, Va.	Harrell's Champion Cotton and Peanut Grower.	Avoca	S	5.18	3.64	8.82	1.06	.98	2.04	**1.75**				15.98
3075	------do	----do	Edenton	R	5.45	2.79	8.24	.79	1.55	2.34	2.00				16.64
2569	Imperial Co., Norfolk, Va.	Imperial Champion Guano	----do	R	5.18	2.82	8.00	.82	1.20	2.02	2.08				15.55
2772	------do	Imperial Cisco Soluble Guano	----do	R	4.65	5.53	10.18	.67	1.55	2.22	2.35				18.41
2653	------do	Imperial Peanut and Corn Guano.	Siler City	R	7.18	2.55	9.73	1.10	1.35	2.45	2.23				18.56
2780	Lister's Agricultural Chemical Works, Newark, N. J.	Lister's Success Fertilizer	Kinston	R	7.48	2.62	10.10	.27	1.74	2.01	2.05				17.45
2674	Meadows, E. H. & J. A. Co., New Bern, N. C.	Meadows' Cotton Guano	Elizabeth City	R	4.82	3.36	8.18	1.30	.70	2.00	**1.84**				15.39
2939	Miller Fertilizer Co., Baltimore, Md.	Ammoniated Dissolved Bone	Autreyville	R	6.08	1.92	8.00	.32	1.94	2.26	3.00				17.28
2756	Navassa Guano Co., Wilmington, N. C.	Navassa C. S. Meal Guano	Hickory	R	5.85	2.19	8.04	.29	2.14	2.43	2.04				16.77
2942	------do	Navassa Grain Fertilizer													

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1903—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value Per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.										
2755	Navassa Guano Co., Wilmington, N. C.	Occoneechee Tobacco Guano	Autreyville	R	5.60	1.68	**7.28**	.77	1.56	2.33	2.46	2.65	----	5.05	$ 16.25
2703	Ober, G., & Sons Co., Baltimore, Md.	Ober's Special Cotton Compound.	Edenton	S	8.88	1.22	10.10	.99	1.02	2.01	2.25	----	----	----	17.59
2964	------do	Ober's Standard Tobacco Fertilizer.	Elkin	S	8.20	2.00	10.20	1.36	.90	2.26	2.28	2.28	----	3.50	18.47
2620	Patapsco Guano Co., Baltimore, Md.	Sea Gull Ammoniated Guano	Mt. Olive	R	6.85	2.99	9.84	1.18	1.34	2.52	2.00	----	----	----	18.61
2866	Piedmont-Mt. Airy Guano Co., Norfolk, Va.	Piedmont Special for Cotton, Corn and Peanuts,	Pine Level	S	6.62	1.80	8.42	1.21	.58	**1.79**	2.34	----	----	----	15.52
2938	------do	Upshur's Grain, Grass and Cotton Fertilizer.	Elizabeth City	S	6.08	1.78	**7.86**	1.12	.88	2.00	2.64	----	----	----	15.98
2894	Pocahontas Guano Co., Lynchburg, Va.	Carrington's Banner Brand Guano.	Haw River	R	4.95	4.09	9.04	1.20	.87	2.07	2.24	----	----	----	16.81
2720	Pocomoke Guano Co., Norfolk, Va.	Crescent Complete Compound	Warsaw	D	4.95	3.74	8.69	1.25	.97	2.22	3.30	----	----	----	18.11
2704	------do	L. B. H. Premium	Edenton	R	6.08	2.73	8.81	.40	1.62	2.02	2.12	----	----	----	16.32
2804	------do	Pamlico Superphosphate	Lexington	R	5.85	3.24	9.09	.55	1.58	2.13	2.07	----	----	----	16.85
3065	------do	----do	Wilkesboro	R	3.55	5.00	8.55	.69	1.52	2.21	**1.98**	----	----	----	16.50
2715	Powhatan Chemical Co., Richmond, Va.	Magic Cotton Grower	Louisburg	R	6.12	2.71	8.83	.40	1.60	2.00	2.13	----	----	----	16.29
3027	------do	Magic Special Fertilizer	Garysburg	S	4.44	3.55	**7.99**	.58	1.74	2.32	2.37	----	----	----	15.96
2908	------do	Magic Tobacco Grower	Greensboro	S	5.25	2.62	**7.87**	.38	1.87	2.25	2.40	2.40	----	8.90	16.47
2766	Rasin Monumental Co., Baltimore, Md.	Rasin's Empire Guano	Oxford	R	5.30	3.20	8.50	.39	1.51	**1.90**	2.09	----	----	----	15.65
3095	------do	----do	Mt. Airy	S	4.41	3.98	8.39	.62	1.69	2.31	**1.81**	----	----	----	16.47
2855	Richmond Guano Co., Richmond, Va.	Hunter and Dunn's Ammoniated Fertilizer	Raleigh	R	5.21	2.81	8.03	.54	1.47	2.01	2.33	----	----	----	15.82
2705	------do	Premium Brand Fertilizer	Edenton	R	7.12	2.60	9.72	.40	1.52	**1.92**	2.35	----	----	----	17.09
2723	------do	Premium Tobacco Fertilizer	Princeton	R	5.62	3.08	8.70	.51	1.29	**1.80**	2.04	2.04	----	8.00	15.47
3096	------do	----do	Mt. Airy	S	6.06	3.32	9.38	.99	.96	**1.95**	2.02	2.02	----	2.30	16.51
2599	Royster, F. S., Guano Co., Norfolk, Va.	Farmers Bone Fertilizer	Edenton	S	7.25	1.59	8.84	.88	1.28	2.16	2.03	----	----	----	16.67

2861	Swift Fertilizer Works, Atlanta, Ga.	Swift's Golden Harvest Guano	Albemarle	R	4.68	4.17	8.85	.82	1.35	2.17	2.01				18.35
2878	do	Swift's Red Star Guano	Gastonia	R	3.88	3.81	**7.69**	1.86	.42	2.28	2.14				16.11
2976	do	do	Monroe	R	4.40	2.55	**6.95**	.10	2.48	2.58	2.26				16.48
2694	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Anchor Brand Fertilizer.	Seagrove	R	5.38	2.65	8.03	.53	1.47	2.00	2.29				15.74
2919	do	Allison & Addison's Old Hickory Guano.	Benson	R	7.65	1.62	9.27	1.21	.55	**1.76**	2.32				16.17
2975	do	Blacksburg Soluble Guano	Bellcross	R	5.85	2.31	8.16	.77	1.33	2.10	**1.94**				15.40
2553	do	Cotton-seed Meal Soluble Guano.	Wilmington	N	5.75	2.10	**7.85**	.52	2.40	2.92	2.21				18.25
2981	do	Diamond Dust	Benson	D	6.00	2.41	8.41	.42	1.66	2.08	2.04				16.05
2614	do	Eagle Island Ammoniated Guano.	Mt. Olive	R	6.95	1.89	8.84	.86	1.00	**1.86**	**1.62**				15.32
3044	do	do	Pilot Mountain	R	5.85	2.48	8.33	.38	1.70	2.08	2.13				16.08
2542	do	Electric Standard Guano	Goldsboro	R	6.55	1.60	8.15	.70	1.78	2.48	2.50				17.52
2650	do	Eureka Ammoniated Bone	Edenton	R	5.50	2.59	8.09	.64	1.74	2.38	2.37				17.03
3048	do	do	Kenly	S	4.86	3.34	8.20	1.37	1.09	2.46	2.78				17.82
2660	do	Farmer's Favorite Fertilizer	Fayetteville	D	6.02	1.98	8.00	.45	2.03	2.48	2.29				17.15
2558	do	Farmer's Friend Fertilizer	Hertford	R	5.60	2.41	8.01	.57	1.81	2.38	2.39				16.97
2534	do	Genuine Bone and Peruvian Guano.	Edenton	R	4.98	2.78	**7.76**	.75	1.73	2.48	2.40				17.06
2827	do	do	Raleigh	R	5.78	2.25	8.03	.93	1.38	2.31	**1.82**				16.16
2557	do	Genuine Slaughter House Bone Guano.	Edenton	R	6.00	2.46	8.46	.74	1.94	2.68	2.04				17.90
2826	do	do	Raleigh	R	5.60	2.58	8.18	.82	1.53	2.35	**1.98**				16.59
3041	do	do	Hendersonville	R	6.35	2.63	8.98	.85	1.19	2.04	**1.96**				16.36
2690	do	National Fertilizer	Clinton	R	5.80	2.31	8.11	.22	1.64	**1.86**	2.13				15.22
2930	do	National Special Tobacco Fertilizer.	Centreville	R	4.85	3.70	8.55	1.05	1.05	2.10	**1.78**	1.78		4.50	15.95
2522	do	Old Dominion Soluble Guano	Tarboro	R	4.70	2.99	**7.69**	.75	1.78	2.53	2.58				17.35
2829	do	do	Raleigh	R	5.50	3.19	8.69	.73	1.39	2.12	2.05				16.44
3064	do	do	Edenton	D	4.89	3.33	8.22	.28	1.72	2.00	**1.77**				15.34
2852	do	Old Dominion Soluble Tobacco Guano.	Roxboro	R	5.50	2.50	8.00	.48	1.68	2.16	2.15	2.15		2.60	16.04
2588	do	Owl Brand Guano	Edenton	R	5.85	2.20	8.05	.80	1.63	2.43	**1.96**				16.69
2831	do	do	Raleigh	R	7.02	3.04	10.06	.88	1.18	2.06	1.63				17.03
2918	do	Plant Food	Benson	D	6.50	2.20	8.70	.38	1.68	2.06	2.13				16.35
3103	do	Stonewall Guano	Edenton	S	4.68	1.99	**6.67**	.38	1.75	2.13	2.03				14.63
2879	do	The Leader	Gastonia	D	6.00	2.15	8.15	.35	1.52	**1.87**	2.17				15.33
2680	do	Tinsley's Lee Brand Guano	Cane Creek	R	5.32	2.84	8.16	.29	1.91	2.20	2.20				16.36
2743	do	Tinsley's Stonewall Guano	Four Oaks	R	6.12	1.97	8.09	1.58	.53	2.11	2.32				16.16
3008	do	Tinsley's Stonewall Tobacco Fertilizer.	Winston	R	5.87	2.44	8.31	.80	1.36	2.16	2.25	2.25		5.60	16.44
2754	do	Wilson Standard Guano	Dunn	D	6.00	2.00	8.00	.38	2.02	2.40	3.18				17.90

N. D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1903—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value Per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.										
2825	Va.-Car. Chemical Co., Richmond, Va.	Winston's Special for Cotton	Raleigh	R	6.48	2.87	9.35	.32	1.92	2.24	2.15	----	----	------	$ 17.50
3067	------do	----do	Jerome	D	6.72	2.01	8.73	.27	1.77	2.04	2.34	----	----	------	16.55
3100	Va. State Fertilizer Co., Lynchburg, Va.	Virginia State High Grade Guano.	Monroe	R	5.30	3.90	9.20	1.59	.89	2.48	2.13	----	----	------	18.06
2952	------do	Virginia State High Grade Tobacco Guano.	Taylorsville	S	5.82	3.96	9.78	1.15	1.26	2.41	2.33	2.33	----	3.70	18.49
	Brands claiming						**8.00**			**2.50**	**1.00**	----	----	------	**15.80**
2946	Etiwan Fertilizer Co., Charleston, S. C.	Plow Brand Raw Bone Superphosphate.	Wadesboro	D	4.85	3.68	8.53	1.90	.56	2.46	1.50	----	----	------	16.71
2958	Armour's Fertilizer Works, Baltimore, Md.	Armour's King Cotton Fertilizer.	Pembroke	R	4.78	2.05	**6.83**	.59	2.29	2.88	1.11	----	----	------	16.01
	Brand claiming						**8.00**			**2.50**	**1.50**	----	----	------	**16.35**
2781	Va.-Car. Chemical Co., Richmond, Va.	Charlotte Ammoniated Fertilizer.	Siler City	N	6.18	2.49	8.67	.34	2.14	2.48	**1.47**	----	----	------	16.86
	Brands claiming						**8.00**			**2.00**	**1.50**	----	----	------	**14.85**
2572	American Fertilizer Co., Norfolk, Va.	Peruvian Mixture	Elizabeth City	R	5.48	3.61	9.09	.26	2.12	2.38	**1.49**	----	----	------	16.96
2631	Imperial Co., Norfolk, Va.	Imperial Cotton Grower	Edenton	R	5.88	3.17	9.05	.84	1.75	2.59	**1.36**	----	----	------	17.41
2770	------do	Imperial Standard Premium Guano.	--do	R	5.38	2.67	8.05	.79	1.23	2.02	**1.37**	----	----	------	**14.81**
	Brands claiming						**8.00**			**2.50**	**2.00**	----	----	------	**16.90**
2663	Acme Mfg. Co., Wilmington, N. C.	Latimer's Complete Fertilizer	Laurinburg	D	6.25	1.76	8.01	.18	2.82	3.00	2.08	----	----	------	18.50
2610	------do	----do	Burgaw	D	6.38	1.83	8.21	.35	2.47	2.82	**1.97**	----	----	------	18.01
2767	------do	Standard Guano	Creedmoor	D	5.28	2.19	**7.47**	.95	1.58	2.53	2.79	----	----	------	17.38
2740	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Eclipse Ammoniated Guano	Smithfield	R	7.10	2.15	9.25	.95	1.53	**2.48**	2.48	----	----	------	18.49
3038	------do	----do	Marshville	R	5.88	2.25	8.13	.44	1.90	2.34	2.28	----	----	------	16.85
2794	Columbia Guano Co., Norfolk, Va.	Columbia High Grade Special Tobacco Guano.	Hillsboro	S	6.50	1.91	8.41	1.43	1.21	2.64	2.83	2.83	----	8.20	18.60
3066	------do	Columbia High Grade Special Tobacco Guano.	Elkin	S	5.70	2.46	8.16	.83	1.61	2.44	2.02	2.02	----	9.10	16.89

3019	Lister's Agricultural Chemical Works, Newark, N. J.	Lister's Ammoniated Dissolved Bone Phosphate.	Concord	R	5.50	3.19	8.69	.99	1.58	2.57	2.65				18.51
2664	Navassa Guano Co., Wilmington, N. C.	Ammoniated Soluble Navassa Guano.	Laurinburg	R	6.62	1.38	8.00	1.36	1.16	2.52	2.75				17.78
3003	do	Navassa Guano for Tobacco	Stokesdale	R	5.62	2.63	8.25	1.00	1.32	2.32	2.59	2.59		6.40	17.23
2994	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Tobacco Compound Guano.	Walnut Cove	S	5.30	2.90	8.20	1.64	1.11	2.75	2.45				18.32
3010	Virginia State Fert. Co., Lynchburg, Va.	G. E. Special Tobacco Guano	Burlington	R	4.25	3.20	**7.45**	.79	1.66	**2.45**	2.43	2.43		2.40	16.73
	Brand claiming						**8.00**			**2.25**	**2.25**				**16.43**
2718	Richmond Guano Co., Richmond, Va.	Special Premium Brand for Tobacco.	Pine Level	R	6.12	2.90	9.02	.38	1.65	2.03	2.41	2.41		7.50	16.85
	Brands claiming						**8.00**			**2.25**	**2.50**				**16.70**
2933	Reidsville Fertilizer Co., Reidsville, N. C.	Broad Leaf Tobacco Guano	Siloam	R	5.95	2.83	8.78	.67	1.90	2.57	3.04	3.04		3.10	18.93
3032	do	do	Pilot Mountain	R	4.39	3.73	8.12	.80	1.54	2.34	2.88	2.88		3.70	17.50
	Brands claiming						**8.00**			**2.50**	**2.50**				**17.45**
2765	American Fertilizer Co., Norfolk, Va.	Bob White Fertilizer for Tobacco.	Winston	R	5.45	2.60	8.05	.81	2.14	2.95	2.83				19.21
3057	do	do	Edenton	R	6.45	2.35	8.80	.62	1.75	2.37	2.71	2.71		8.10	18.01
	Brand claiming						**8.00**			**2.00**	**3.00**				**16.50**
3092	Navassa Guano Co., Wilmington, N. C.	Harvest King Guano	Washington	S	6.68	1.49	8.17	.87	1.07	**1.94**	3.15				16.64
	Brands claiming						**8.00**			**2.00**	**6.00**				**19.80**
2617	Navassa Guano Co., Wilmington, N. C.	Navassa Fruit Grower	Mt. Olive	N	6.15	1.65	**7.80**	1.34	1.56	2.90	**5.91**				22.24
3088	do	do	Mt. Airy	R	6.22	2.34	8.56	1.72	.87	2.59	**4.32**				20.23
	Brands claiming						**8.00**			**2.50**	**3.00**				**18.00**
2597	Acme Manufacturing Co., Wilmington, N. C.	Tip-Top Tobacco Grower	Greenville	R	6.62	2.01	8.63	1.04	1.54	2.58	3.21	3.21		7.55	19.03
2892	Atlantic Chemical Co., Norfolk, Va.	Atlantic Tobacco Grower	Burlington	R	5.42	2.31	**7.73**	1.21	1.62	2.83	**2.73**	2.73		8.05	18.45
2665	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Caraleigh Special Tobacco Guano.	Wake Forest	R	6.02	2.02	8.04	.89	1.94	2.83	3.39	3.39		6.00	19.46
2822	do	do	Raleigh	R	6.52	2.18	8.70	.23	2.36	2.59	3.04	3.04		5.45	18.84
2712	do	Planters Pride	Franklinton	R	7.20	1.80	9.00	.89	1.67	2.56	3.51				19.64
2865	Farmers' Guano Co., Raleigh, N. C.	Big Crop Guano	Dunn	S	6.42	2.33	8.55	1.03	1.64	2.67	3.17				19.19
2714	do	Toco Tobacco Guano	Louisburg	R	7.10	2.14	9.24	.92	1.73	2.65	3.59	3.59		6.45	20.21
2998	do	do	Raleigh	R	8.00	2.24	10.24	.13	2.01	**2.14**	**1.82**	1.82		4.20	**17.64**
2925	Imperial Co., Norfolk, Va.	Imperial Guano for Bright Tobacco.	Washington	R	5.55	2.53	8.08	1.29	1.30	2.59	**2.82**	2.82		5.70	18.14
2836	Patapsco Guano Co., Baltimore, Md.	Patapsco Special Tobacco Mixture.	Edenton	R	5.50	2.95	8.45	1.11	1.50	2.61	3.01	3.01		10.50	18.74
2676	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Guano for Tobacco	Kinston	R	5.50	2.85	8.35	.33	2.19	2.52	3.36	3.36		6.70	18.77
2545	Powhatan Chemical Co., Richmond, Va.	White Leaf Tobacco Fertilizer	do	R	6.25	2.00	8.25	.58	2.12	2.70	**2.80**	2.80		2.40	18.60

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1903—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value Per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.										
2959	Richmond Guano Co., Richmond, Va.	Tip-Top Fertilizer	Ruffin	S	5.35	3.02	8.37	1.27	1.58	2.85	3.23	----	----	------	$ 19.63
2528	Royster, F. S., Guano Co., Norfolk, Va.	Orinoco Tobacco Guano	Kenly	S	6.55	1.76	8.31	.97	1.58	2.55	3.15	3.15	----	3.10	18.59
2717	Va.-Carolina Chemical Co., Richmond, Va.	Blue Star	Warsaw	D	6.30	1.96	8.26	.79	1.96	2.75	3.01	----	----	------	18.99
2546	------do	Carolina Golden Belt Ammoniated Guano for Tobacco.	Jacksonville	D	6.05	1.42	**7.47**	1.34	1.66	3.00	3.49	2.59	.90	1.95	19.56
2911	------do	------do	Reidsville	R	5.45	2.55	8.00	1.52	1.17	2.69	3.16	3.16	----	7.60	18.75
3031	------do	------do	Pilot Mountain	D	5.72	2.84	8.56	.70	1.25	1.95	3.10	3.10	----	6.50	16.96
2887	------do	Cooper's Special Bright Tobacco Fertilizer.	Bethel	R	5.65	1.88	**7.53**	1.85	.97	2.82	3.29	3.29	----	6.35	18.86
2641	------do	Killikinnick Tobacco Mixture	LaGrange	D	5.90	2.36	8.26	1.09	1.50	2.59	3.11	3.11	----	4.00	18.63
2533	------do	N. C. Farmers' Alliance Official Guano.	Edenton	R	4.80	2.73	**7.53**	.62	2.16	2.78	3.72	----	----	------	19.08
3059	------do	------do	Coinjock	R	5.76	2.49	8.25	1.02	1.55	2.57	2.77	----	----	------	18.18
2523	------do	Osceola Tobacco Guano	Tarboro	R	5.15	2.90	8.05	.94	2.22	3.16	3.84	3.84	----	9.15	20.94
2753	------do	Pilot Ammoniated Guano Special for Tobacco.	Dunn	D	6.60	1.99	8.59	.80	1.74	2.54	2.20	2.20	----	7.50	17.70
2625	------do	Superlative Cotton Seed Meal Goods.	Mt. Olive	D	5.65	2.89	8.54	.50	2.50	3.00	**2.75**	----	----	------	19.71
	Brands claiming						**8.00**			**2.75**	**2.00**	----	----	------	**17.65**
2673	N. C. Cotton Oil Co., Raleigh, N. C.	Raleigh Standard Guano	Kinston	D	6.25	2.38	8.63	.06	2.96	3.02	2.37	----	----	------	19.43
2989	------do	------do	Garner	R	6.00	2.72	8.72	.24	2.54	2.78	2.09	----	----	------	18.49
	Brands claiming						**8.00**			**2.75**	**2.50**	----	----	------	**18.20**
2872	Hadley, J. C., & Co., Wilson, N. C.	Hadley's Boss Guano	Wilson	D	6.75	1.53	8.28	.77	1.70	**2.47**	**2.44**	----	----	------	17.55
2873	------do	------do	------do	R	6.50	1.65	8.15	1.13	1.38	**2.51**	**2.37**	----	----	------	17.47
2622	Va.-Car. Chemical Co., Richmond, Va.	Delta	Greenville	S	5.60	2.55	8.15	1.28	2.19	3.47	2.65	----	----	------	20.65
	Brand claiming						**8.00**			**2.50**	**3.50**	----	----	------	**18.55**
3029	Baugh & Sons Co., Norfolk, Va.	Mason's Guano	Battleboro	R	5.15	3.66	8.81	.30	2.38	2.68	3.41	----	----	------	19.72

Brands claiming							**8.00**			**2.00**	**4.00**						**17.60**
2589	Miller Fertilizer Co., Baltimore, Md.	Potato and Vegetable Grower	Elizabeth City	R	5.02	3.57	8.59	.76	1.48	2.24	4.12						18.98
2965	Swift's Fertilizer Works, Atlanta, Ga.	Swift's Pioneer High Grade Tobacco Guano.	Elkin	D	5.30	2.75	8.05	.47	2.10	2.57	4.41	2.02	2.39	1.60			19.81
Brand claiming							**8.00**			**2.75**	**4.00**						**19.85**
2734	Lynchburg Guano Co., Lynchburg, Va.	Solid Gold Tobacco Guano	Henderson	R	6.25	2.89	9.14	1.58	1.36	2.94	4.07	.06	4.01	.05			21.52
Brands claiming							**8.00**			**3.00**	**2.00**						**18.40**
2661	Navassa Guano Co., Wilmington, N. C.	Navassa Cotton Seed Meal Special 3 Per Cent Guano.	Maxton	D	6.25	2.46	8.71	.95	2.41	3.36	2.07						20.19
3093	------do	----do	Washington	R	4.88	3.21	8.09	1.24	2.11	3.35	**1.98**						19.51
2757	Va.-Car. Chemical Co., Richmond, Va.	Special 3 Per Cent Guano	Autreyville	D	4.85	3.19	8.04	.82	2.10	**2.92**	2.60						18.86
Brands claiming							**8.00**			**3.00**	**2.50**						**18.95**
2549	Acme Manufacturing Co., Wilmington, N. C.	Acme Fertilizer	Wilmington	D	6.05	1.95	8.00	1.12	2.52	3.44	2.76						20.56
3050	------do	------do	Marshville	R	6.40	2.46	8.86	.34	2.61	**2.95**	2.09						19.12
2727	------do	Acme Fertilizer for Tobacco	Williamston	R	6.75	1.86	8.61	.96	2.14	3.10	2.67	2.67		4.85			19.99
3094	------do	----do	Pilot Mountain	R	7.32	1.79	9.11	.44	2.41	**2.85**	**2.31**	2.31		5.20			19.29
2619	Va.-Car. Chemical Co., Richmond, Va.	Good Luck—C. S. M. Goods	Mt. Olive	D	6.15	1.88	8.03	1.07	2.84	3.91	2.84						22.08
2741	------do	Split Silk	Four Oaks	R	7.80	1.58	9.38	.79	1.95	2.74	2.25						19.14
2824	------do	----do	Raleigh	R	6.95	2.83	9.78	.85	2.17	3.02	2.60						20.72
Brands claiming							**8.00**			**3.00**	**3.00**						**19.50**
2754	American Agricultural Chemical Co., New York, N. Y.	Lazaretto Special for Tobacco and Potatoes.	Edenton	R	8.88	.25	9.13	1.03	2.30	3.33	3.27	3.27		8.15			21.80
2679	American Fertilizer Co., Norfolk, Va.	American Eagle Guano	New Bern	R	5.55	2.56	8.11	.95	2.27	3.22	3.00						20.26
2874	------do	----do	Nashville	R	6.75	1.68	8.43	2.15	1.35	3.50	3.11						21.51
3082	------do	----do	Waxhaw	D	5.99	2.12	8.11	2.37	.66	3.03	**2.60**						19.25
2863	------do	Blalock's High Grade Guano	Norwood	R	6.02	2.00	8.02	1.76	1.80	3.56	3.05						21.25
2910	------do	J. G. Miller & Co.'s Yellow Leaf Fertilizer.	Reidsville	R	5.80	2.40	8.20	.61	2.31	**2.92**	3.81	3.81		9.30			20.33
2915	Armour Fertilizer Works, Baltimore, Md.	Armour's Tobacco Special	Burgaw	R	5.58	2.63	8.21	.83	2.25	3.08	3.05	3.05		2.80			19.98
2978	Ashepoo Fertilizer Co., Charleston, S. C.	Carolina XXX Guano	Monroe	R	4.30	4.56	8.86	.68	2.35	3.03	3.37						20.77
3007	Atlantic Chemical Co., Norfolk, Va.	Atlantic High Grade Tobacco Guano.	Elkin	R	5.58	2.13	**7.71**	1.04	2.46	3.50	**2.83**	2.83		7.20			20.55
2520	Baugh & Sons Co., Norfolk, Va.	Baugh's High Grade Tobacco Guano.	Washington	R	5.95	2.91	8.86	.95	2.55	3.50	3.28						22.08
2539	------do	Grand Rapid Guano	Elizabeth City	R	5.55	3.08	8.63	1.45	2.12	3.57	3.33						22.14
3069	------do	----do	Concord	S	6.02	2.13	8.15	1.46	1.79	3.25	**2.91**						20.29
2926	Bragaw, Wm., & Co., Washington, N. C.	Beaufort County Guano	Washington	R	7.15	1.53	8.68	2.21	1.06	3.27	**2.79**						20.69

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1903—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value Per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.										
2711	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Horne's Best	Franklinton	R	7.60	1.48	9.08	1.85	1.65	**2.50**	3.77	----	----	------	$ 19.82
2821	------do	----do	Raleigh	R	6.50	2.35	8.85	1.39	1.71	3.10	3.32	----	----	------	20.92
3098	------do	----do	Marshville	R	7.75	1.03	8.78	.67	1.92	**2.59**	3.10	----	----	------	19.08
2525	Columbia Guano Co., Norfolk, Va.	Hyco Tobacco Guano	Tarboro	S	6.55	3.04	9.59	1.22	2.00	3.22	3.31	3.31	----	7.60	21.93
2962	------do	----do	Raleigh	S	4.92	4.44	9.36	1.62	1.52	3.14	3.15	3.16	----	7.30	21.31
2948	Etiwan Fertilizer Co., Charleston, S. C.	Etiwan Cotton Compound	Wadesboro	S	5.83	2.46	8.29	1.93	.75	**2.68**	**2.96**	----	----	------	18.76
2624	Farmers Guano Co., Raleigh, N. C.	Golden Grade Guano	Mt. Olive	R	6.70	2.06	8.76	.63	2.58	3.21	3.77	----	----	------	21.66
2996	Hampton Guano Co., Norfolk, Va.	Hampton Tobacco Guano	Walnut Cove	R	6.62	1.75	8.37	1.88	1.13	3.01	**2.94**	2.94	----	11.60	19.80
2937	------do	Princess Prolific Producer	Yeopan	R	6.85	1.16	8.01	2.02	1.02	3.04	3.10	----	----	------	19.74
2584	Home Fertilizer and Chemical Works, Baltimore, Md.	Yancey's Formula for Yellow Leaf Tobacco.	Mackey's Ferry	D	4.40	3.64	8.04	1.37	1.24	**2.61**	2.43	.20	2.23	.15	17.74
2571	Imperial Co., Norfolk, Va.	Imperial Tobacco Guano	Edenton	R	3.18	4.68	**7.86**	1.49	1.43	**2.92**	4.98	4.98	----	8.05	21.31
2891	MacMurphy, W. C., & Co., Charleston, S. C.	Special 8-3-3 Tobacco Guano	Fair Bluff	R	7.12	4.65	11.77	.87	2.16	3.03	2.88	2.88	----	6.80	22.85
2675	Meadows, E. H. & J. A., Co., New Bern, N. C.	Meadows' Gold Leaf Tobacco Grower.	Kinston	D	5.55	3.52	9.07	.78	2.17	**2.95**	2.94	.13	2.81	.10	20.25
2634	Miller Fertilizer Co., Baltimore, Md.	Standard Phosphate	Elizabeth City	R	4.75	3.61	8.36	1.03	2.25	3.28	3.09	----	----	------	20.76
2796	Murray, W. A., Co., Mebane, N.C.	Murray's Special Fertilizer	Mebane	R	5.65	2.48	8.13	1.18	2.09	3.27	3.31	----	----	------	20.77
2730	Navassa Guano Co., Wilmington, N. C.	Clarendon Tobacco Guano	Edenton	R	5.30	2.17	**7.47**	1.16	1.70	2.86	3.24	3.24	----	6.05	18.87
3083	------do	----do	Waxhaw	B	6.05	2.21	8.26	.61	2.64	3.25	**2.47**	2.47	----	5.70	19.90
2616	Ober, G., & Sons Co., Baltimore, Md.	Ober's Special Compound for Tobacco.	Mt. Olive	R	8.60	1.55	10.15	2.24	1.18	3.42	3.39	1.06	2.33	.80	23.12
3072	------do	----do	Elkin	S	7.92	1.99	9.91	2.43	.98	3.41	3.53	2.26	1.27	1.70	23.03
2692	Patapsco Guano Co., Baltimore, Md.	Choctaw Guano	Ashboro	R	6.32	2.17	8.49	.94	2.18	3.12	3.36	----	----	------	20.70
2832	------do	----do	Raleigh	R	5.20	2.83	8.03	1.28	2.23	3.51	**2.99**	----	----	------	21.05
2923	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Levering's Reliable Tobacco Guano.	New Bern	R	7.35	1.55	8.90	2.01	.53	**2.54**	**2.95**	2.95	----	8.00	18.88

2672	Pocomoke Guano Co., Norfolk, Va.	Monarch Tobacco Grower	Kinston	R	6.90	2.16	9.06	.72	2.30	3.02	3.25	3.25	----	7.95	20.78
2721	---do	Harvey's High Grade Monarch	Clinton	D	6.00	2.50	8.50	1.20	1.93	3.13	3.15	----	----	------	20.50
2735	Powhatan Chemical Co., Richmond, Va.	P. C. Co.'s Hustler	Henderson	R	5.80	2.54	8.34	.70	2.41	3.11	**2.79**	----	----	------	19.90
2621	Richmond Guano Co., Richmond, Va.	Gilt-Edge Fertilizer	Washington	R	6.60	3.48	10.08	.42	1.85	**2.27**	**2.04**	----	----	------	**18.13**
3005	---do	---do	Rockingham	R	4.58	3.50	8.08	.68	3.22	3.90	**2.63**	----	----	------	21.86
2947	Read Phosphate Co., Charleston, S. C.	Read's Tobacco Leaf	Wadesboro	R	7.05	2.00	9.05	.86	2.07	**2.93**	3.31	3.31	----	3.80	20.57
2651	Royster, F. S., Guano Co., Norfolk, Va.	Bonanza Tobacco Guano	Edenton	R	6.72	1.99	8.71	1.28	1.82	3.10	3.00	3.00	----	6.70	20.43
2777	Va.-Car. Chemical Co., Richmond, Va.	Amazon High Grade Manure	Four Oaks.	D	6.20	1.94	8.14	1.41	1.33	**2.74**	**2.80**	----	----	------	18.63
2532	---do	Bright Leaf Tobacco Grower	Plymouth	R	4.90	2.76	**7.66**	.61	2.87	3.48	3.89	3.89	----	4.20	21.61
2524	---do	Farmer's Friend High Grade Fertilizer.	Tarboro	R	5.60	3.03	8.63	.92	2.58	3.50	3.38	----	----	------	21.98
2707	---do	Farmer's Friend Special Tobacco Fertilizer.	Washington	R	7.12	1.97	9.09	.98	1.86	**2.84**	**2.87**	2.87	----	5.75	19.86
2875	---do	---do	Rocky Mount	R	4.12	3.18	7.30	3.67	1.26	4.93	3.66	3.66	----	5.70	25.39
2719	---do	Golden Leaf Bright Tobacco Guano.	Warsaw	R	5.85	2.15	8.00	1.02	1.74	**2.76**	3.11	3.11	----	4.60	18.90
2867	---do	Gold Medal Guano	---do	R	6.25	2.09	8.34	1.48	1.01	**2.49**	**2.71**	----	----	------	17.96
2547	---do	Old Kentucky High Grade Tobacco Manure.	Jacksonville	D	5.30	1.87	**7.17**	1.30	1.86	3.16	3.72	3.65	.07	2.75	20.02
2586	---do	Owl Brand Guano for Tobacco	Edenton	R	5.72	2.66	8.38	1.04	2.28	3.32	3.63	3.63	----	5.40	21.49
3033	---do	---do	Elkin	R	5.75	3.48	9.23	1.23	1.52	**2.75**	**1.72**	1.72	----	4.80	18.45
2956	Virginia State Fertilizer Co., Lynchburg, Va.	Bull Dog Soluble Guano	Clayton	S	6.00	3.11	9.11	2.27	1.04	3.31	3.23	----	----	1.00	21.68
2726	---do	Dunnington's Special Formula for Tobacco.	Williamston	R	6.10	3.24	9.34	1.49	1.21	**2.70**	3.18	.13	3.05	.10	**20.60**
3045	---do	---do	Siloam	R	5.45	3.16	8.61	1.76	1.59	3.35	**2.97**	----	2.97	------	21.06
	Brands claiming						**8.00**	------	------	**3.00**	**4.00**	----	----	------	**20.60**
2779	Va.-Car. Chemical Co., Richmond, Va.	Groom's Special Tobacco Fertilizer.	Fremont	N	6.20	2.66	8.86	.50	2.68	3.18	**3.63**	----	----	------	21.51
2957	---do	---do	Garner	R	5.00	2.55	**7.55**	.52	2.64	3.16	**3.72**	----	----	------	20.37
	Brand claiming						**8.00**	------	------	**3.50**	**7.50**	----	----	------	**25.95**
2936	Camp, W. H., Petersburg, Va.	Camp's Prepared Chemicals	Edenton	D	4.65	3.55	8.20	3.71	.62	4.33	8.15	----	----	------	29.34
	Brand claiming						**8.00**	------	------	**3.00**	**10.00**	----	----	------	**27.20**
2551	Baugh & Sons Co., Norfolk, Va.	Baugh's Fruit and Berry Guano.	Wilmington	R	7.12	2.49	9.61	1.94	1.33	3.27	**9.22**	----	----	------	28.60
	Brand claiming						**8.00**	------	------	**4.00**	**2.50**	----	----	------	**21.95**
2995	Va.-Car. Chemical Co., Richmond, Va.	Tinsley's Tobacco Fertilizer	Mount Airy	R	6.25	2.21	8.46	2.58	2.02	4.60	2.01	----	----	------	23.63
	Brands claiming						**8.00**	------	------	**4.00**	**3.00**	----	----	------	**22.50**
2543	Va.-Car. Chemical Co., Richmond, Va.	Capital Tobacco Fertilizer	Goldsboro	D	6.52	1.36	**7.98**	1.17	3.42	4.59	3.03	3.03	----	2.90	24.28
2596	---do	---do	Greenville	R	5.70	2.16	**7.86**	2.40	1.68	4.08	3.52	3.52	----	1.25	23.19

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1903—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.											Relative Value Per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.		
MIXED FERTILIZERS.																
	Brands claiming						**8.00**			**4.00**	**4.00**					**$23.60**
2632	Miller Fertilizer Co., Baltimore, Md.	Miller's Irish Potato	Elizabeth City	S	5.10	3.28	8.38	2.17	2.37	4.54	4.76					26.39
2611	Navassa Guano Co., Wilmington, N. C.	Coree Tobacco Guano	Magnolia	R	6.55	1.68	8.23	1.97	2.33	4.30	**3.97**	3.97		4.35		24.67
2561	---do	Navassa Special Truck Guano	Elizabeth City	S	5.50	2.73	8.23	1.64	2.58	4.22	4.42					24.93
2899	Royster, F. S., Guano Co., Norfolk, Va.	Truckers' Delight—High Grade Potato Manure.	--do	R	5.35	3.96	9.31	2.24	1.58	**3.82**	**3.37**					**23.54**
	Brand claiming						**8.00**			**4.50**	**4.00**					**25.10**
2544	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Star Brand Vegetable Grower.	Goldsboro	D	6.35	1.78	8.13	1.62	3.20	4.82	**3.80**					25.95
	Brands claiming						**8.00**			**4.00**	**5.00**					**24.70**
2652	American Fertilizer Co., Norfolk, Va.	Peruvian Mixture Guano for Sweet Potatoes.	Hertford	R	6.50	2.35	8.85	1.97	1.83	**3.80**	5.19					25.07
2877	Va.-Car. Chemical Co., Richmond, Va.	Truck Farmers' Special Ammoniated Guano.	Gastonia	R	6.62	2.16	8.78	2.04	1.91	**3.95**	**4.96**					25.21
	Brand claiming						**8.00**			**5.00**	**5.00**					**27.70**
2582	Va.-Car. Chemical Co., Richmond, Va.	Norfolk Truck and Tomato Grower.	Edenton	S	5.50	2.50	8.00	2.41	2.53	**4.94**	5.74					28.34
	Brand claiming						**8.00**			**5.00**	**7.00**					**29.90**
2682	Armour Fertilizer Works, Baltimore, Md.	Armour's Bone, Blood and Potash.	Elizabeth City	R	5.95	2.41	8.36	.90	4.24	5.14	7.73					31.45
	Brand claiming						**8.40**			**3.00**	**4.00**					**20.96**
2924	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Special Farmers Tobacco Guano.	Washington	R	7.40	1.48	8.88	1.44	1.36	**2.80**	**3.91**	3.91		12.00		**20.69**
	Brands claiming						**8.50**			**2.00**	**2.00**					**15.85**
2778	Acme Mfg. Co., Wilmington, N. C.	Gem Fertilizer	Fremont	D	6.00	2.73	8.73	.57	1.71	2.28	**1.92**					16.81
2977	Ashepoo Fertilizer Co., Charleston, S. C.	Eutaw XX Guano	Monroe	R	4.70	4.75	9.45	.70	1.46	2.16	2.33					17.55
2731	Pocomoke Guano Co., Norfolk, Va.	Electric Crop Grower	Elizabeth City	R	5.05	3.49	8.54	.66	1.40	2.06	2.08					16.15
2639	------do	Pocomoke Superphosphate	Beston	R	5.82	3.41	9.23	.99	1.47	2.46	2.05					17.94
3037	------do	------do	Marshville	R	5.65	3.02	8.67	.77	1.35	2.12	**1.92**					16.28

2860	Read Phosphate Co., Nashville, Tenn.	Read's Soluble Fish Guano	Albemarle	D	5.40	2.66	8.06	.49	1.67	2.16	2.28					16.24
	Brands claiming						**8.50**			**2.50**	**2.50**					**17.90**
2736	Pocomoke Guano Co., Norfolk, Va.	Cinco Tobacco Guano	Wadkins	R	6.00	2.58	8.58	.89	1.73	2.62	2.74	2.74		8.75		18.60
3051	------do	----do	Wilkesboro	R	6.35	2.50	8.80	.91	1.68	2.59	2.68	2.68		9.00		18.64
	Brand claiming						**8.50**			**2.75**	**2.00**					**18.10**
2742	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Anchor Brand Tobacco Fertilizer.	Four Oaks	R	6.70	1.68	8.38	1.25	1.42	2.67	3.26	3.26		2.90		19.14
	Brand claiming						**8.50**			**2.75**	**2.25**					**18.37**
2801	Richmond Guano Co., Richmond, Va.	Carolina Bright Special Tobacco Fertilizer.	Black Creek	R	5.75	2.70	**8.45**	1.21	1.53	**2.74**	2.39	2.39		5.05		18.45
	Brands claiming						**9.00**			**2.25**	**1.00**					**15.95**
2618	Bradley Fertilizer Co., Boston, Mass.	Sea Fowl Guano	Mount Olive	D	5.10	4.55	9.65	1.19	1.26	2.45	1.43					17.60
3039	------do	------do	Monroe	D	5.88	3.85	9.73	1.33	1.18	2.51	1.40					17.83
2803	The Quinnipiac Co., Boston, Mass.	Quinnipiac Pine Island Ammoniated Superphosphate.	Elm City	D	6.60	2.72	9.32	1.29	1.04	2.33	1.26					16.76
	Brands claiming						**9.00**			**2.00**	**2.00**					**16.30**
2991	American Agricultural Chemical Co., Newark, N. J.	Gold Dust Guano	Edenton	R	5.70	2.85	**8.55**	1.17	.94	2.11	2.24					16.49
2903	Etiwan Fertilizer Co., Charleston, S. C.	Etiwan Ammoniated Dissolved Bone.	Wadesboro	R	7.38	2.45	9.83	.37	1.56	**1.93**	3.52					18.50
3026	Lister's Agricultural Chemical Works, Newark, N. J.	Lister's Harvest Queen	South Mills	D	5.25	4.23	9.48	.98	1.03	2.01	2.09					16.86
2615	Ober, G., & Sons Co., Baltimore, Md.	Ober's Special Ammoniated Dissolved Bone.	Mount Olive	R	9.45	1.86	11.31	1.04	1.12	2.16	2.13					19.00
2893	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Essential Tobacco Compound.	Burlington	R	7.35	1.79	9.14	1.07	1.01	2.08	2.11	2.11		6.05		16.79
	Brand claiming						**9.00**			**2.50**	**1.50**					**17.25**
3012	Parker & Hunt, Oxford, N. C.	Parker & Hunt Special Tobacco Fertilizer.	Oxford	R	6.70	3.08	9.78	1.00	1.39	**2.39**	2.08	2.09		8.20		18.26
	Brands claiming						**9.00**			**2.50**	**2.00**					**17.80**
2637	Va.-Car. Chemical Co., Richmond, Va.	Choctaw High Grade Special Tobacco Fertilizer.	Goldsboro	D	6.38	1.90	**8.28**	1.03	2.33	3.36	2.55	2.55		2.90		20.34
2713	------do	Eureka Bone Special for Tobacco.	Louisburg	R	6.55	2.45	9.00	.89	1.39	**2.28**	**1.87**	1.87		2.40		**17.00**
2850	------do	Owl Brand Special Tobacco Guano.	Roxboro	D	6.80	3.51	10.31	1.75	1.85	3.60	**1.86**	1.26	.60	.95		22.12
	Brands claiming						**9.00**			**2.75**	**2.00**					**18.55**
2642	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Pacific Tobacco and Cotton Grower.	LaGrange	R	6.75	3.05	9.80	.85	2.22	3.07	3.29	3.29		6.40		21.64
2999	------do	----do	Raleigh	R	8.05	2.21	10.26	.48	1.97	**2.45**	**1.84**	1.84		4.10		18.61
2820	------do	----do	Raleigh	R	5.82	2.09	**7.91**	.81	2.68	3.49	2.79	2.79		5.00		20.66
2527	Columbia Guano Co., Norfolk, Va.	Columbia C. S. M. Special	Tarboro	R	7.75	2.31	10.06	.86	2.02	2.88	2.09					19.99
2890	MacMurphy, W. C., & Co., Charleston, S. C.	Wilcox, Gibbs & Co.'s Guano	Fair Bluff	R	7.45	2.16	9.61	1.21	1.82	3.03	2.17					20.13
3000	------do	----do	Rowland	R	7.00	2.70	9.70	.92	1.90	2.82	2.16					19.57
2600	Royster, F. S., & Co., Norfolk, Va.	Royster's Meal Mixture	Edenton	R	8.10	1.43	9.53	.86	2.04	2.90	2.27					19.77

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1903—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	Relative Value Per Ton at Factory.
					MIXED FERTILIZERS.										
2733	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Star Brand Special Tobacco Manure.	Henderson	D	6.05	2.96	9.01	1.59	1.24	2.83	2.03	2.03	----	4.35	$ 18.83
2640	------do	Prolific Cotton Grower	Beston	D	7.62	1.51	9.13	.70	2.30	3.00	**1.82**	----	----	------	19.21
2802	------do	White Stem	Black Creek	D	6.65	2.50	9.15	.77	2.05	2.82	2.33	----	----	------	19.25
3047	------do	----do	Kenly	D	6.22	3.33	9.55	.83	2.05	2.88	2.60	----	----	------	20.09
	Brands claiming						**9.00**			**2.25**	**4.00**	----	----	------	**19.25**
2997	Hampton Guano Co., Norfolk, Va.	Arlington Animal Bone Fertilizer.	Walnut Cove	S	7.88	1.91	9.79	1.04	1.65	2.69	3.98	----	----	------	21.26
2552	Pocomoke Guano Co., Norfolk, Va.	Monticello Animal Bone Fertilizer.	Wilmington	R	7.12	2.67	9.79	.79	1.76	2.55	4.35	----	----	------	21.24
	Brands claiming						**9.00**			**3.00**	**2.00**	----	----	------	**19.30**
2587	Va.-Car. Chemical Co., Richmond, Va.	Cotton-seed Meal Standard Guano.	Edenton	R	6.62	2.34	**8.96**	.95	2.39	3.34	2.35	----	----	------	20.67
2828	------do	L. & M. Special Guano	Raleigh	R	5.88	2.41	**8.29**	1.61	1.39	3.00	2.36	----	----	------	19.06
	Brand claiming						**9.00**			**3.00**	**2.25**	----	----	------	**19.57**
2854	Richmond Guano Co., Richmond, Va.	Hunter & Dunn's Special Ammoniated Fertilizer.	Raleigh	R	5.42	3.38	8.80	1.58	1.20	**2.78**	2.66	----	----	------	19.19
	Brands claiming						**9.00**			**3.00**	**3.00**	----	----	------	**20.40**
2862	Ober, G., & Sons Co., Baltimore, Md.	Ober's Special High Grade Fertilizer.	Albemarle	R	7.68	1.58	9.26	2.18	1.00	3.18	3.61	----	----	------	21.84
2573	Patapsco Guano Co., Baltimore, Md.	Patapsco Tobacco Fertilizer	Edenton	R	7.12	2.56	9.68	1.09	2.21	3.30	3.40	----	----	------	22.35
	Brands claiming						**9.00**			**3.50**	**5.00**	----	----	------	**24.10**
2598	American Fertilizer Co., Norfolk, Va.	Pitt County Special Fertilizer for Yellow Leaf Tobacco.	Greenville	R	7.00	2.40	9.40	1.11	2.37	**3.48**	5.25	5.25	----	6.00	24.67
2678	------do	Special Formula for Yellow Leaf Tobacco.	New Bern	R	5.88	2.17	8.05	1.18	2.22	**3.40**	5.97	1.00	4.97	.75	24.01
	Brands claiming						**9.25**			**2.50**	**2.00**	----	----	------	**18.02**
2612	Patapsco Guano Co., Baltimore, Md.	Patapsco Guano for Tobacco	Faison	R	7.12	2.78	9.90	1.15	1.73	2.88	2.16	----	----	------	19.92
2833	------do	----do	Raleigh	R	7.40	2.55	9.95	1.15	1.35	2.50	2.12	----	----	------	18.79
2983	------do	----do	Kenly	R	7.12	2.78	9.90	.82	1.70	2.52	2.10	2.10	----	6.60	18.78
3099	------do	----do	Monroe	S	8.35	2.01	10.36	1.78	1.10	2.88	**1.83**	----	----	------	19.98

	Brand claiming						**5.00**			**10.00**	**2.50**							**37.25**
2519	Baugh & Sons Co., Norfolk, Va.	Baugh's New Process Ten Per Cent Guano.	Washington	R	3.50	2.98	6.48	7.55	2.61	10.16	3.17							39.80
	Brand claiming						**6.00**			**2.00**	**6.00**							**18.00**
2982	Va.-Car. Chemical Co., Richmond, Va.	Old Dominion Sweet Potato Manure.	Benson	R	4.75	1.63	6.38	1.07	1.21	2.28	**4.79**							**17.85**
	Brand claiming						**6.00**			**4.00**	**8.00**							**26.20**
2550	Acme Mfg. Co., Wilmington, N. C.	Acme Truck Grower	Wilmington	D	4.85	1.85	6.70	1.00	2.81	**3.81**	**6.67**							**24.80**
	Brand claiming						**6.00**			**5.00**	**5.00**							**25.90**
2602	Imperial Company, Norfolk, Va.	Williams' Special Potato Guano	Elizabeth City	R	4.35	3.16	7.51	1.68	2.98	**4.66**	**4.95**							26.18
	Brands claiming						**6.00**			**5.00**	**7.00**							**28.10**
2562	American Fertilizer Co., Norfolk, Va.	Special Potato Manure	Elizabeth City	R	4.05	3.19	7.24	3.68	1.60	5.28	7.01							30.07
2518	Baugh & Sons Co., Norfolk, Va.	Baugh's Peruvian Guano Substitute.	Washington	R	4.38	2.29	6.67	3.24	1.96	5.20	7.44							28.79
2601	Imperial Company, Norfolk, Va.	Imperial Potato Guano	Elizabeth City	R	4.40	2.59	6.99	1.85	3.25	5.10	6.28							28.50
	Brand claiming						**6.00**			**5.50**	**7.00**							**29.60**
2633	Miller Fertilizer Co., Baltimore, Md.	High Grade Potato	Elizabeth City	R	3.52	2.91	6.43	2.15	3.53	5.68	7.46							31.03
	Brands claiming						**6.00**			**7.00**	**5.00**							**31.90**
2537	Baugh & Sons Co., Norfolk, Va.	Baugh's Cabbage Guano	Elizabeth City	R	3.92	2.86	6.78	4.40	2.50	**6.90**	5.45							32.80
2538	------do	Baugh's Seven Per Cent Potato Guano.	----do	R	4.05	2.42	6.47	5.45	2.03	7.48	5.26							34.05
2603	Piedmont-Mount Airy Guano Co., Baltimore, Md.	Upshur's Seven Per Cent Irish Potato Guano.	----do	S	3.65	3.11	6.76	4.24	2.08	**6.32**	5.53							31.12
2575	Pocomoke Guano Co., Norfolk, Va.	Seaboard Popular Trucker	----do	R	3.95	2.88	6.83	2.47	4.73	7.20	5.35							33.63
3025	Va.-Car. Chemical Co., Richmond, Va.	Old Dominion Truck Guano	Greenville	R	3.90	4.70	8.60	4.58	2.15	**6.73**	5.14							33.58
	Brands claiming						**7.00**			**5.00**	**5.00**							**26.80**
2536	American Agricultural Chemical Co., New York, N. Y.	Zells' Truck Grower	Edenton	S	5.05	3.46	8.51	2.07	3.31	5.38	5.61							29.97
2691	Patapsco Guano Co., Baltimore, Md.	Patapsco Trucker	Ashboro	S	6.38	1.67	8.05	2.85	2.31	5.16	5.36							28.62
2590	Pocomoke Guano Co., Norfolk, Va.	Standard Truck Guano	Elizabeth City	S	4.30	2.75	7.05	2.35	4.42	6.77	5.38							32.57
2635	Royster, F. S., Guano Co., Norfolk, Va.	Royal Potato Guano	----do	S	5.12	2.13	7.25	2.25	2.45	**4.70**	6.23							27.47
	Brand claiming						**7.00**			**5.00**	**7.00**							**29.00**
2560	Navassa Guano Co., Wilmington, N. C.	Navassa Root Crop Fertilizer	Elizabeth City	S	5.38	2.85	8.23	3.09	1.87	**4.96**	**6.93**							29.89
	Brand claiming						**7.00**			**6.00**	**5.00**							**29.80**
2729	Richmond Guano Co., Richmond, Va.	Special High Grade for Truck	Edenton	R	6.30	2.54	8.84	1.75	3.04	**4.79**	**4.58**							**27.36**
	Brands claiming						**7.00**			**7.00**	**5.00**							**32.80**
2563	American Fertilizer Co., Norfolk, Va.	Standard Seven Per Cent Ammoniated Guano.	Elizabeth City	R	4.25	3.27	7.52	2.98	3.70	**6.68**	5.87							33.27
3061	------do	do	Washington	S	4.17	2.89	7.06	3.67	3.45	7.12	**4.83**							33.02

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1903—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value Per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
	MIXED FERTILIZERS.														
	Brand claiming						**7.00**			**5.00**	**8.00**				**$ 30.10**
2636	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Early Truck Guano	Elizabeth City	R	5.00	2.50	7.50	2.51	2.59	5.10	8.91				31.88
	Brands claiming						**7.00**			**7.00**	**7.00**				**35.00**
2649	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Special Truck Guano	Elizabeth City	S	4.75	2.78	7.53	3.15	3.22	**6.37**	6.99				**33.57**
2834	Va.-Car. Chemical Co., Richmond, Va.	Best Potato Manure	Edenton	R	3.72	3.38	7.10			**6.21**	**6.46**				**32.01**
	Brand claiming						**6.00**			**2.00**	**6.00**				**18.00**
2837	Imperial Company, Norfolk, Va.	Imperial Sweet Potato Fertilizer.	Elizabeth City	R	4.68	2.32	7.00	.90	1.02	**1.92**	6.24				18.92
	Brand claiming						**6.00**			**6.00**	**6.00**				**30.00**
2762	Va.-Car. Chemical Co., Richmond, Va.	Tinsley's Irish Potato Guano	Grimesland	R	4.35	2.15	6.50	3.30	2.05	**5.35**	6.95				**29.54**
	Brand claiming						**5.00**			**10.00**	**2.50**				**37.25**
2835	Va.-Carolina Chemical Co., Richmond, Va.	Tinsley's Ten Per Cent Truck Guano.	Elizabeth City	S	4.12	1.53	5.65	4.95	2.74	**7.69**	3.95				**32.50**
	Brand claiming						**4.00**			**3.00**	**5.00**				**18.10**
2763	Imperial Company, Norfolk, Va.	Imperial Cubanola Tobacco Guano.	Greenville	S	3.15	2.47	5.62	1.36	1.49	**2.85**	5.45	5.45		8.95	19.60
	Brands claiming						**4.00**			**4.00**	**6.00**				**22.20**
2570	Imperial Company, Norfolk, Va.	Imperial Laughinghouse's Special Tobacco Guano.	Edenton	R	5.30	.55	5.85	1.50	2.66	4.16	6.20	6.20		9.50	24.57
2886	------do	----do	Coneto	R	2.88	1.80	4.68	1.60	2.06	**3.66**	6.92	6.92		10.15	22.80
	Brands claiming						**8.00**				**2.25**				**9.67**
2883	Navassa Guano Co., Wilmington, N. C.	Warlick's Mixture	Forest City	R	4.50	4.68	9.18				2.25				10.74
2895	Va.-Carolina Chemical Co., Richmond, Va.	Allison & Addison's McGavock Special Potash Mixture.	Burlington	R	5.07	3.64	8.71				**2.11**				10.16
3043	------do	----do	Mooresville	D	3.70	3.76	**7.46**				2.44				**9.40**
	Brands claiming						**8.00**				**4.00**				**11.60**
2922	Powhatan Chemical Co., Richmond, Va.	Powhatan Bone and Potash Mixture.	Benson	R	5.70	3.46	9.16				**3.84**				12.47

2992	Richmond Guano Co., Richmond, Va.	Premium Peanut Grower	Edenton	S	5.25	2.02	8.27		4.00			11.84
2984	Va.-Carolina Chemical Co., Richmond, Va.	Carr's Special Wheat Grower	Benson	R	5.75	2.75	8.50		**3.85**			11.89
2696	------do	Miller's Special Wheat Mixture.	Randleman	R	4.62	4.15	8.77		**3.70**			11.96
	Brands claiming						**8.50**		**2.00**			**9.85**
2805	Va.-Carolina Chemical Co., Richmond, Va.	Old Dominion Dissolved Bone and Potash.	Lexington	R	6.85	1.26	**8.11**		**1.83**			**9.31**
3015	Va. State Fertilizer Co., Lynchburg, Va.	Gilt-Edge Dissolved Bone and Potash.	Burlington	D	3.12	5.56	8.68		2.20			10.23
	Brand claiming						**10.00**		**1.00**			**10.10**
2931	Va.-Carolina Chemical Co., Richmond, Va.	Quick-Step Soluble Bone and Potash.	Winston	R	5.20	3.84	**9.04**		**1.78**			**10.09**
	Brand claiming						**10.00**		**1.50**			**10.65**
2798	Va.-Carolina Chemical Co., Richmond, Va.	Great Wheat and Corn Grower	Durham	R	5.65	5.16	10.81		**1.72**			11.62
	Brands claiming						**10.00**		**2.00**			**11.20**
2565	American Fertilizer Co., Norfolk, Va.	Dissolved Bone and Potash Guano for Wheat and Corn.	Elizabeth City	N	8.00	4.06	12.06		2.23			13.31
2654	------do	----do	Hertford	D	6.80	2.95	**9.75**		2.80			11.86
2884	Atlantic Chemical Co., Norfolk, Va.	Atlantic Bone and Potash Mixture.	Shelby	R	6.39	3.86	10.25		**1.72**			11.12
2914	Baugh & Sons Co., Norfolk, Va.	Baugh's Soluble Alkaline Superphosphate.	Edenton	D	2.55	7.95	10.50		2.06			11.72
2799	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Electric Bone and Potash Mixture.	Hillsboro	D	6.90	4.65	11.55		**1.85**			12.43
2809	------do	----do	Raleigh	R	6.68	3.25	**9.93**		2.81			12.03
2914	Columbia Guano Co., Norfolk, Va.	Columbia Bone and Potash	Greensboro	R	6.38	4.24	10.62		2.05			11.81
2783	Farmers Guano Co., Raleigh, N. C.	Century Bone and Potash Mixture.	Siler City	D	7.72	4.47	12.19		2.05			13.22
2606	Imperial Company, Norfolk, Va.	Imperial Bone and Potash	Hobgood	N	6.90	3.05	**9.95**		**1.81**			**10.94**
2759	Navassa Guano Co., Wilmington, N. C.	Navassa Dissolved Bone and Potash.	Autreyville	S	6.95	2.81	**9.76**		2.19			11.19
2960	Ober, G., & Sons Co., Baltimore, Md.	Ober's Dissolved Bone Phosphate and Potash.	Milton	R	11.42	.70	12.12		2.34			13.48
3090	------do	----do	Elkin	D	10.90	3.37	9.59		**1.31**			14.28
2857	Patapsco Guano Co., Baltimore, Md.	Patapsco Soluble Bone and Potash.	Roxboro	D	3.90	5.69	**9.59**		2.05			10.89
2683	Powhatan Chemical Co., Richmond, Va.	Bone and Potash Mixture	Kinston	R	5.45	5.15	10.60		2.08			11.82
2840	Richmond Guano Co., Richmond, Va.	----do	Chapanoke	D	5.50	5.34	10.84		**1.90**			11.85
3052	------do	----do	Wilkesboro	D	6.15	4.23	10.38		**1.61**			11.11
2626	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Bone and Potash Mixture.	Mt. Olive	D	4.32	5.26	**9.58**		**1.80**			10.60

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1903—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value Per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.										
2843	Va.-Carolina Chemical Co., Richmond, Va.	Allison & Addison's B. P. Potash Mixture.	Gibsonville	D	6.08	4.10	10.18	------	------	------	**1.73**	----	----	------	$ 11.06
2966	------do	Bone and Potash Compound	Statesville	D	8.38	3.79	12.17	------	------	------	**1.84**	----	----	------	12.98
3068	------do	----do	Kenly	D	8.50	3.33	11.83	------	------	------	2.37	----	----	------	13.25
2689	------do	Capital Bone and Potash Compound.	Clinton	D	7.81	2.75	10.56	------	------	------	**1.98**	----	----	------	11.68
2760	------do	Dissolved Bone and Potash	Roseboro	N	7.60	2.68	10.28	------	------	------	**1.76**	----	----	------	11.18
2882	------do	Durham Bone and Potash Mixture.	Gastonia	R	6.25	3.33	**9.58**	------	------	------	2.38	----	----	------	11.24
3087	------do	----do	Bellcross	D	5.62	4.44	10.06	------	------	------	**1.63**	----	----	------	**10.85**
2773	------do	High Grade Alkaline Bone and Potash.	Elizabeth City	D	5.58	4.17	**9.75**	------	------	------	2.01	----	----	------	**10.98**
2844	------do	Mammoth Corn Grower	Gibsonville	R	5.62	3.34	8.96	------	------	------	2.03	----	----	------	**10.30**
3053	------do	----do	Wilkesboro	R	5.27	4.87	10.14	------	------	------	**1.67**	----	----	------	10.96
2782	------do	Mammoth Wheat and Grass Grower.	Siler City	D	6.20	5.11	11.31	------	------	------	**1.95**	----	----	------	12.32
3042	------do	Navassa Dissolved Bone	Henderson	R	5.45	4.45	**9.90**	------	------	------	2.39	----	----	------	11.54
2920	------do	Norfolk Bone and Potash Fertilizer.	Benson	D	6.55	3.45	10.00	------	------	------	2.85	----	----	------	12.13
2928	------do	Owl Brand Acid Phosphate with Potash.	Mooresville	D	4.30	4.00	**8.30**	------	------	------	2.19	----	----	------	**9.88**
2967	------do	Standard Wheat Grower	Statesville	S	7.12	3.88	11.00	------	------	------	**1.75**	----	----	------	11.82
2943	------do	Ten-Two Bone and Phosphate	---do	R	6.12	3.86	**9.98**	------	------	------	**1.98**	----	----	------	**11.16**
2841	------do	Tinsley's Bone and Potash Mixture.	Edenton	D	7.12	4.18	11.30	------	------	------	**1.48**	----	----	------	11.80
2806	------do	Winston's Bone and Potash Compound.	Granite	R	6.22	3.49	**9.71**	------	------	------	2.10	----	----	------	11.05
	Brands claiming						**10.00**	------	------	------	**3.00**	----	----	------	**12.30**
2697	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Morris & Scarboro's Special Bone and Potash Mixture.	Ashboro	N	6.45	4.09	10.54	------	------	------	**2.89**	----	----	------	12.67
2912	Va.-Car. Chemical Co., Richmond, Va.	Diamond Wheat Manure	Reidsville	R	4.75	5.36	10.11	------	------	------	**1.78**	----	----	------	11.06

	Brands claiming						**10.00**				**4.00**				**13.40**
2868	Va.-Car. Chemical Co., Richmond, Va.	Va.-Car. Chemical Co.'s Special Potash Mixture.	Albemarle	R	6.42	3.36	**9.78**				**3.68**				**12.85**
2913	do	Winner Grain Mixture	Reidsville	R	6.30	3.67	**9.97**				**3.32**				12.62
3046	do	do	Pilot Mountain	R	6.39	3.32	**9.71**				4.61				13.81
2953	Va. State Fertilizer Co., Lynchburg, Va.	XX Potash Mixture	Taylorsville	D	7.15	4.90	12.95				3.33				14.51
	Brand claiming						**10.00**				**5.00**				**14.50**
3014	Va. State Fertilizer Co., Lynchburg, Va.	Mountain Top Bone and Potash	Burlington	R	6.25	4.52	10.77				5.53				15.78
	Brands claiming						**11.00**				**2.00**				**12.10**
2708	Berkley Chemical Co., Norfolk, Va.	Berkley Bone and Potash Mixture.	Edenton	R	6.50	4.86	11.36				2.08				12.51
2921	Patapsco Guano Co., Baltimore, Md.	Baltimore Soluble Phosphate	Benson	R	6.62	4.50	11.12				**1.96**				12.16
2688	Pocomoke Guano Co., Norfolk, Va.	Alkali Bone	Clinton	R	6.82	4.23	11.05				2.35				12.54
	Brands claiming						**11.00**				**5.00**				**15.40**
2808	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Horne & Sons High Grade Bone and Potash.	Raleigh	R	7.52	4.14	11.66				**3.49**				**14.33**
2746	Patapsco Guano Co., Baltimore, Md.	Patapsco High Grade Bone Potash.	Four Oaks	R	6.20	5.15	11.35				**4.99**				15.70
	Brands claiming						**12.00**				**3.00**				**14.10**
3016	Va.-Car. Chemical Co., Richmond, Va.	Battle's Crop Grower	Burlington	R	7.45	4.69	12.14				3.22				14.47
2842	do	Reaper Grain Application	Graham	D	7.80	4.24	12.04				3.44				14.62
	Brand claiming						**12.00**				**6.00**				**17.40**
3020	Swift Fertilizer Works, Atlanta, Ga.	Swift's Dayvault Special High Grade Phosphate and Potash	Concord	R	8.20	4.11	12.31				**5.58**				**17.22**
	Brands claiming						**8.00**			**2.00**					**13.20**
2655	Baugh & Sons Co, Norfolk, Va.	Special Cotton Guano	Edenton	R	5.35	3.65	9.00	.67	1.54	2.21					14.73
2972	Lynchburg Guano Co., Lynchburg, Va.	Bright Belt Guano	Marshville	R	5.00	4.67	9.67	1.09	.99	2.08					14.94
	Brand claiming						**12.00**			**2.00**					**16.80**
2592	Home Fertilizer Chemical Works, Baltimore, Md.	Boykin's Dissolved Animal Bone.	Mackey's Ferry	R	10.70	2.49	13.19	1.27	1.54	2.81					20.30
	Brand claiming									**9.00**	**2.50**				**29.75**
2776	Home Fertilizer Chemical Works, Baltimore, Md.	Cerealite Top Dressing	Edenton	S						10.02	4.54				35.05
	Brand claiming									**7.00**	**7.00**				**28.70**
2593	Home Fertilizer Chemical Works, Baltimore, Md.	Home Fertilizer Chemicals	Mackey's Ferry	S						7.10	8.64				30.80

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1903—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	Relative Value Per Ton at Factory.
	RAW OR UNMIXED FERTILIZER MATERIALS.														
	Brands claiming						**10.00**								$ **8.00**
2870	Richmond Guano Co., Richmond, Va.	Old Homestead Dissolved Bone	Princeton	D	7.32	5.15	12.47								9.98
3054	do	do	Wilkesboro	D	7.68	4.43	12.11								9.69
2885	Va.-Car. Chemical Co., Richmond, Va.	Catawba Acid	Forest City	D	4.82	4.61	**9.43**								**7.54**
2988	do	Champion Acid Phosphate	Wilkesboro	R	7.00	3.56	10.56								8.45
3004	do	Durham Acid Phosphate	Stokesdale	D	3.25	6.71	**9.96**								**7.97**
2847	do	Horse Shoe Brand Acid Phosphate.	Gibsonville	D	4.32	4.68	**9.00**								**7.20**
2954	do	Owl Brand Acid Phosphate	Mocksville	R	3.65	6.81	10.46								8.37
2934	do	Stonewall Acid Phosphate	Winston	D	5.30	4.52	**9.82**								**7.86**
	Brands claiming						**12.00**								**9.60**
2896	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Staple Caraleigh Acid Phosphate.	Burlington	R	7.88	5.18	13.06								10.45
2709	Columbia Guano Co., Norfolk, Va.	Columbia Acid Phosphate	Edenton	R	11.08	4.14	15.22								12.17
2902	Navassa Guano Co., Wilmington, N. C.	Navassa Acid Phosphate	Lincolnton	R	7.80	5.10	12.90								10.32
2971	Richmond Guano Co., Richmond, Va.	Dissolved S. C. Phosphate	Siloam	R	7.00	5.82	12.82								10.26
3078	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Acid Phosphate	Edenton	N	10.38	3.56	13.94								11.15
2789	do	Royster's XX Acid Phosphate	Siler City	R	8.95	3.23	12.18								9.74
2970	Swift Fertilizer Works, Atlanta, Ga.	Swift's Chattahoochee Acid Phosphate.	Morganton	N	4.50	6.80	**11.30**								**9.04**
2700	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Standard Acid Phosphate.	Seagrove	D	8.40	3.65	12.05								9.64
2932	do	Capital Dissolved S. C. Bone	Centreville	R	4.10	5.40	9.50								**7.60**
2594	do	Royster's High Grade Acid Phosphate.	Hancock	D	6.58	4.25	**10.83**								**8.66**
3049	do	do	Dunn	N	7.88	4.01	**11.89**								**9.51**
2933	do	Tar Heel Acid Phosphate	Waughtown	R	5.50	5.58	**11.08**								**8.86**

3034	Va. State Fertilizer Co., Lynchburg, Va.	Alps Brand Acid Phosphate	Burlington	D	7.88	4.88	12.76												10.21
2955	do	do	Statesville	R	9.08	4.43	13.51												10.81
	Brands claiming						**13.00**												**10.40**
2917	Acme Mfg. Co., Wilmington, N.C.	Acme Acid Phosphate	Magnolia	N	11.10	3.08	14.18												11.34
2807	American Fertilizer Co., Norfolk, Va.	Eagle High Grade Acid Phosphate.	Liberty	N	8.48	3.68	**12.16**												**9.73**
2555	Armour Fertilizer Works, Baltimore, Md.	Armour's Acid Phosphate	Wilmington	N	9.55	3.08	**12.63**												10.10
2929	Ashepoo Fertilizer Co., Charleston, S. C.	Ashepoo High Grade Acid Phosphate.	Mooresville	N	11.80	2.93	14.73												11.78
3021	do	Ashepoo XXX Acid Phosphate	Charlotte	R	11.18	4.08	15.26												12.21
2644	Atlantic Chem. Co., Norfolk, Va.	Atlantic Dissolved Bone	Mt. Olive	D	9.40	2.91	**12.31**												**9.84**
2698	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Sterling High Grade Acid Phosphate.	Ashboro	D	7.30	5.73	13.03												10.42
2815	do	do	Raleigh	D	7.82	4.99	**12.81**												**10.25**
2748	Columbia Guano Co., Norfolk, Va.	Columbia Dissolved Bone	Four Oaks	D	9.72	3.28	13.00												10.40
2814	do	Columbia High Grade Dissolved Bone.	Raleigh	R	9.55	3.46	13.01												10.41
2905	Etiwan Fertilizer Co., Charleston, S. C.	Diamond Soluble Bone	Wadesboro	N	11.00	3.05	14.05												11.24
2790	Farmers Guano Co., Norfolk, Va.	Farmers' High Grade Acid Phosphate.	Siler City	R	8.85	4.93	18.78												11.02
3022	MacMurphy, W. C., & Co., Charleston, S. C.	High Grade Acid Phosphate	Charlotte	D	11.15	3.20	14.35												11.48
2630	Navassa Guano Co., Wilmington, N. C.	High Grade Dissolved Bone	Mt. Olive	D	11.61	1.73	13.34												10.67
3002	do	do	Barnesville	N	10.00	3.14	13.14												10.51
2949	Read Phosphate Co., Charleston, S. C.	Read's High Grade Acid Phosphate.	Wadesboro	N	8.90	5.51	14.41												11.53
2859	Richmond Guano Co., Richmond, Va.	Hunter & Dunn's Dissolved Bone.	Raleigh	D	7.75	5.79	13.54												10.83
2987	do	Premium Dissolved Bone	Wilkesboro	R	8.30	5.09	13.39												10.61
2792	Royster, F. S., Guano Co., Norfolk, Va.	Royster's High Grade Dissolved Bone.	Liberty	D	8.90	4.59	13.49												10.79
2791	Swift Fertilizer Works, Atlanta, Ga.	Swift's Harrow High Grade Acid Phosphate.	Liberty	D	8.30	5.11	13.41												10.73
2629	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's I X L Acid Phosphate.	Faison	N	10.60	2.44	13.04												10.43
2845	do	Charlotte Acid Phosphate	Graham	R	8.25	3.92	**12.17**												**9.74**
3081	do	do	Matthews	D	6.80	6.88	13.68												10.94
2554	do	Cotton Brand High Grade Acid Phosphate.	Jacksonville	N	10.12	3.62	13.74												10.99
2627	do	Crenshaw's Acid Phosphate or Dissolved S. C. Bone.	Faison	N	11.25	1.87	13.12												10.50
2737	do	Double Bone Phosphate, Extra Strong.	Moyock	N	9.88	3.12	13.00												10.40
2810	do	do	Raleigh	D	7.18	5.02	**12.28**												**9.76**

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1903—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	Relative Value Per Ton at Factory.
RAW OR UNMIXED FERTILIZER MATERIALS.															
2871	Va.-Carolina Chemical Co., Richmond, Va.	Durham High Grade Acid Phosphate.	Warsaw	N	9.62	3.58	13.20								$ 10.56
2628	------do	Norfolk Best Acid Phosphate	Faison	N	9.50	3.67	13.17								10.54
2687	------do	Old Dominion High Grade Bone Phosphate.	Raleigh	N	9.00	3.46	**12.46**								**9.97**
2811	------do	----do	----do	R	8.62	4.71	13.33								10.66
2724	------do	----do	Louisburg	D	8.02	4.98	13.00								10.40
2785	------do	Owl Brand High Grade Phosphate.	Bear Branch	N	9.40	3.60	13.00								10.40
2749	------do	Standard Dissolved S. C. Bone	Warrenton	D	6.72	6.34	13.06								10.45
2812	------do	----do	Raleigh	R	5.82	6.63	**12.45**								9.96
3056	------do	----do	Wilkesboro	R	9.00	4.58	13.58								10.86
2869	------do	Tinsley's Dissolved S. C. Bone	Garland	N	9.92	2.64	**12.56**								**10.05**
2787	------do	Victor High Grade Acid Phosphate.	Siler City	D	8.28	4.72	13.00								10.40
3055	------do	----do	Wilkesboro	R	7.58	5.08	**12.66**								**10.13**
3009	Virginia State Fertilizer Co., Lynchburg, Va.	Clipper Brand Acid Phosphate	Elkin	R	10.45	3.91	14.36								11.49
3035	------do	----do	Burlington	D	8.63	6.18	14.81								11.85
	Brands claiming						**14.00**								**11.20**
2668	Acme Mfg. Co., Wilmington, N. C.	Acme Acid Phosphate	Maxton	N	12.88	2.36	14.74								11.79
2900	American Agricultural Chemical Co., New York.	Detrick's XXtra Acid Phosphate.	Edenton	N	10.10	4.23	14.33								11.46
2701	------do	Lazaretto Dissolved Bone Phosphate.	Washington	D	9.20	5.08	14.28								11.42
2566	American Fertilizer Co., Norfolk, Va.	High Grade Acid Phosphate	Elizabeth City	N	10.85	6.71	17.56								14.05
2800	Armour Fertilizer Co., Baltimore, Md.	Armour's Star Phosphate	Hillsboro	N	10.00	3.23	**13.23**								**10.58**
2685	Arps, Geo. L., & Co., Norfolk, Va.	Fourteen Per Cent Acid Phosphate.	Edenton	D	11.72	2.44	14.16								11.33
3086	------do	----do	----do	D	11.62	3.65	15.27								12.22
2645	Atlantic Chemical Co., Norfolk, Va.	Atlantic Fourteen Per Cent Acid Phosphate.	Mt. Olive	D	10.25	3.43	**13.68**								**10.94**

2567	Baugh & Sons Co., Norfolk, Va.	Baugh's High Grade Acid Phosphate.	Edenton	N	9.25	6.38	15.63											12.50
2669	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Climax Dissolved Bone	Wake Forest	N	12.05	2.70	14.75											11.80
2577	Columbia Guano Co., Norfolk, Va.	Columbia Acid Phosphate	Edenton	R	12.22	2.97	15.19											12.15
2858	Hampton Guano Co., Norfolk, Va.	Hampton Acid Phosphate	Mebane	D	11.08	3.48	14.56											11.65
2595	Harrell, S. B., & Co., Norfolk, Va.	Harrell's Acid Phosphate	Edenton	R	9.92	4.96	14.88											11.90
2578	Imperial Company, Norfolk, Va.	High Grade Acid Phosphate	do	D	10.98	3.31	14.29											11.43
2888	do	do	Conetoe	D	12.35	3.00	15.35											12.28
2784	Meadows, E. H. & J. A., Co., New Bern, N. C.	Diamond Acid Phosphate	Dover	D	8.00	7.01	15.01											12.01
2669	Patapsco Guano Co., Baltimore, Md.	Patapsco Dissolved S. C. Phosphate.	Ashboro	D	10.25	3.76	14.01											11.21
2897	Pocahontas Guano Co., Lynchburg, Va.	Imperial Dissolved S. C. Phosphate.	Haw River	N	10.45	4.13	14.58											11.66
3091	do	do	Hillsboro	N	7.85	6.54	14.39											11.51
2556	Pocomoke Guano Co., Norfolk, Va.	Peerless Acid Phosphate	Wilmington	D	10.15	4.72	14.87											11.89
2738	Rasin Monumental Co., Baltimore, Md.	Rasin's Acid Phosphate	Yanceyville	D	8.08	5.45	**13.53**											**10.82**
3084	do	do	Monroe	D	10.42	3.58	14.00											11.20
2579	Royster, F. S., Guano Co., Norfolk, Va.	Royster's High Grade 14 Per Cent Acid Phosphate.	Edenton	R	10.85	2.50	**13.35**											10.68
2710	do	do	Edenton	R	9.25	5.02	14.27											11.42
2969	Swift Fertilizer Works, Atlanta, Ga.	Swift's Cultivator High Grade Acid Phosphate.	Hickory	D	10.88	3.71	14.59											11.67
3071	do	do	Marshville	N	10.80	3.55	14.35											11.48
2771	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Fulton Acid Phosphate.	Edenton	N	9.95	3.53	**13.48**											10.78
2540	do	Excelsior Dissolved Bone	Edenton	N	10.92	3.08	14.00											10.20
3079	do	do	Edenton	N	9.88	4.35	14.23											11.38
2786	do	Red Cross Acid Phosphate	Siler City	D	10.40	3.65	14.05											11.24
2769	do	Tinsley's Powhatan High Grade Acid Phosphate.	Windsor	N	9.48	4.07	**13.55**											**10.84**
2643	do	do	Mount Olive	N	11.25	3.08	14.33											11.46
2775	do	Travers' Dissolved Bone Phosphate.	Edenton	N	10.55	3.38	**13.93**											11.14
2529	do	Va.-Car. Chemical Co.'s 14 Per Cent Acid Phosphate.	Tarboro	N	9.50	4.69	14.19											11.35
3060	do	do	Creswell	D	9.62	4.47	14.09											11.27
2608	do	Valley of Virginia Bone Phosphate.	Elizabeth City	N	10.00	4.03	14.03											11.22
3080	do	do	Elizabeth City	D	9.70	4.34	14.04											11.23
3017	Virginia State Fertilizer Co., Lynchburg, Va.	Gilt-Edge Brand Acid Phosphate.	Burlington	R	10.98	4.01	14.99											11.99
	Brand claiming						**15.00**											**12.00**
2846	Va.-Car. Chemical Co., Richmond, Va.	Charlotte 15 Per Cent Acid Phosphate.	Graham	N	13.68	3.33	17.01											13.61

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1903—CONTINUED.

RAW OR UNMIXED FERTILIZER MATERIALS.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	Relative Value Per Ton at Factory.
	Brands claiming						**16.00**								$ **12.80**
2904	Atlantic Chemical Co., Norfolk, Va.	Atlantic High Grade 16 Per Cent Acid Phosphate.	Mount Gilead	D	13.60	3.16	16.76								13.41
2684	Columbia Guano Co., Norfolk, Va.	Columbia High Grade 16 Per Cent Acid Phosphate.	Edenton	D	12.25	3.51	**15.76**								**12.61**
2607	Imperial Company, Norfolk, Va.	Imperial High Grade Tennessee Acid Phosphate.	Edenton	N	11.55	2.55	**14.10**								**11.28**
2973	Lynchburg Guano Co., Lynchburg, Va.	Iron-side Acid Phosphate	Marshville	R	12.55	4.18	16.73								13.38
2979	Richmond Guano Co., Richmond, Va.	Rex Dissolved Bone Phosphate	Monroe	R	12.00	5.06	17.06								13.65
3073	------do	----do	Wilkesboro	N	10.25	5.14	**15.39**								**12.31**
2656	Royster, F. S., Guano Co., Norfolk, Va.	Royster's High Grade 16 Per Cent Acid Phosphate.	Edenton	N	13.40	2.56	**15.96**								**12.77**
2993	------do	----do	Sunbury	S	13.45	3.69	17.14								13.71
2788	Va.-Car. Chemical Co., Richmond, Va.	Comet Sixteen Per Cent Acid Phosphate.	Siler City	D	10.45	5.09	**15.54**								**12.43**
3074	------do	----do	Wilkesboro	R	10.32	6.11	16.43								13.14
2747	------do	V. C. C. Co.'s Sixteen Per Cent Acid Phosphate.	Smithfield	D	9.48	5.71	**15.19**								**12.15**
2813	------do	----do	Raleigh	S	9.92	6.24	16.16								12.92
3018	Virginia State Fertilizer Co., Lynchburg, Va.	Bull Run Acid Phosphate	Burlington	N	11.55	5.53	17.08								13.66
	Brands claiming									**19.00**					**49.40**
2945	Baugh & Sons Co., Norfolk, Va.	Nitrate of Soda	Kinston	B						19.16					49.82
2819	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	----do	Raleigh	B						19.16					49.82
	Brands claiming										**12.00**				**12.00**
2906	Acme Mfg. Co., Wilmington, N. C.	Pure German Kainit	Rockingham	S							**15.30**				**15.30**
2750	American Fertilizer Co., Norfolk, Va.	Genuine German Kainit	Warrenton	S							12.56				12.56
2648	Armour Fertilizer Works, Baltimore, Md.	German Kainit	Beston	S							12.32				12.32

2980	Ashepoo Fert. Co., Charleston, S. C.	------do	Matthews	S								12.66				12.66
2647	Atlantic Chemical Co., Norfolk, Va.	------do	Mt. Olive	S								12.08				12.08
2530	Baugh & Sons Co., Norfolk, Va.	------do	Washington	S								**11.38**				**11.38**
3040	------do	------do	Concord	S								12.22				12.22
2940	Berkley Chemical Co., Norfolk, Va.	Genuine German Kainit	Yeopean	S								**11.96**				**11.96**
2646	Best & Thompson, Goldsboro, N. C.	German Kainit	Goldsboro	S								12.68				12.68
2725	Caraleigh Phosphate and Fert. Works, Raleigh, N. C.	Genuine German Kainit	Franklinton	B								**11.74**				**11.74**
2818	----- do	------do	[illegible]	B P								**11.27**				**11.27**
2580	Columbia Guano Co., Norfolk, Va	Genuine Germa[illegible] Kainit	Edenton	S								**11.64**				**11.64**
2901	Hampton Guano Co., Norfolk, Va.	------do	Hertford	S								12.34				12.34
2609	Imperial Co., Norfolk, Va.	------do	Hobgood	R								12.26				12.26
2876	Patapsco Guano Co., Baltimore, Md.	German Kainit	Seaboard	S								**11.74**				**11.74**
2974	Pocomoke Guano Co., Norfolk, Va.	Genuine German Kainit	Edenton	S								**11.94**				**11.94**
2848	Powhatan Chemical Co., Richmond, Va.	Pure German Kainit	Chapanoke	S								**11.74**				**11.74**
2950	Read Phosphate Co., Charleston, S C.	Genuine German Kainit	Wadesboro	R								14.16				14.16
2739	Richmond Guano Co., Richmond, Va.	German Kainit	Edenton	R								12.56				12.56
2581	Royster, F. S., Guano Co., Norfolk, Va.	Genuine German Kainit	----do	S								12.18				12.18
2761	------do	------do	Dunn	R								**11.76**				**11.76**
2670	Sweet, R. N., Wilmington, N. C.	German Kainit	Laurinburg	S								12.16				12.16
2816	Va.-Car. Chemical Co., Richmond, Va.	Genuine German Kainit	Raleigh	B P								**10.31**				**10.31**
	Brand claiming											**45.00**				**45.00**
3024	Ashepoo Fertilizer Co., Charleston, S. C.	Muriate of Potash	Charlotte	S								49.64				49.64
	Brands claiming											**48.00**				**48.00**
2657	Va.-Car. Chem. Co., Richmond, Va.	Muriate of Potash	Edenton	S								48.24				48.24
2817	------do	Muriate of Potash	Raleigh	B P								**46.31**				**46.31**
2941	------do	Muriate of Potash	Raleigh	R								**36.36**				**36.36**
3102	------do	Muriate of Potash	Charlotte	B								52.20				52.20
	Brand claiming											**50.00**				**50.00**
2951	Baugh & Sons Co., Norfolk, Va.	Muriate of Potash	Wadesboro	R								51.23				51.23
	Brand claiming											**2.00**				**2.00**
2686	Lee, A. S. & Son, Richmond, Va.	Lee's Agricultural Lime	Kinston	D								2.39				2.39

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1903—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value Per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate	Potash from Sulphate.	Chlorine.	
RAW OR UNMIXED FERTILIZER MATERIALS.															
	Brand claiming									**4.50**					$------
3023	Baugh & Sons Co., Norfolk, Va.	Baugh's Bone Meal	Concord	N						4.89					*25.58
	Brands claiming									**19.00**					**49.40**
2907	American Fertilizer Co., Norfolk, Va.	Nitrate of Soda	Wadesboro	B						19.28					50.13
2985	Royster, F. S., Guano Co., Norfolk, Va.	Nitrate of Soda	Dunn	B						19.06					49.56

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

*Total Phosphoric Acid found, 21.45, valued in Bone Meal at 3 cents per pound.

II.

ANALYSES OF COTTON-SEED MEAL.

Laboratory Number.	Name and Address of Manufacturer.	Where Sampled.	Per Cent Ammonia Guaranteed.	Per Cent Ammonia Found.
1821	Soper, J. E. & Co., Boston, Mass.	Edenton	8.50	**8.18**
1800	Battleboro Oil Co., Battleboro, N. C.	Battleboro	8.00	**7.79**
1867	Consumer's Cotton Oil Co., Tarboro, N. C.	Wilson	8.00	8.28
1778	Cotton Oil and Fibre Co., Norfolk, Va.	Edenton	8.00	8.58
1810	------do	Edenton	8.00	8.14
1792	Fremont Oil Co , Fremont, N. C.	Fremont	8.00	8.31
1736	Havens Oil Co., Washington, N. C.	Plymouth	8.00	8.40
1862	Highland Park Mfg. Co., Rock Hill, S. C.	Charlotte	8.00	8.76
1844	Independent Cotton Oil Co., Wadesboro, N. C.	Matthews	8.00	8.54
1777	Laurinburg Oil Co., Laurinburg, N. C.	Laurinburg	8.00	**7.87**
1776	N. C. Cotton Oil Co., Charlotte, N. C.	Raeford	8.00	8.37
1795	------do	Charlotte	8.00	**7.94**
1782	N. C. Cotton Oil Co., Henderson, N. C.	Henderson	8.00	8.00
1741	N. C. Cotton Oil Co., Wilmington, N. C.	Wilmington	8.00	**7.59**
1743	N. C. Cotton Oil Co., Raleigh, N. C.	Raleigh	8.00	8.22
1744	------do	----do	8.00	8.29
1745	------do	----do	8.00	8.23
1746	------do	----do	8.00	8.42
1742	New Bern Cotton Oil and Fertilizer Mills, New Bern, N. C.	Polloksville	8.00	8.67
1790	------do	Elizabeth City	8.00	8.06
1771	Pine Level Oil Co., Pine Level, N. C.	Goldsboro	8.00	**7.63**
1848	Rowland Oil and Fertilizer Co., Rowland, N. C.	Rowland	8.00	**7.70**
1839	Southern Cotton Oil Co., Charlotte, N. C.	Marion	8.00	8.68
1803	-----do	Charlotte	8.00	8.38
1801	Southern Cotton Oil Co., Concord, N. C.	Lexington	8.00	8.51
1840	Southern Cotton Oil Co., Gastonia, N. C.	Hickory	8.00	8.68
1836	Southern Cotton Oil Co., Goldsboro, N. C.	Kenly	8.00	**7.70**
1838	Southern Cotton Oil Co., Monroe, N. C.	Marshville	8.00	8.51
1813	Southern Cotton Oil Co , Rocky Mount, N. C.	Enfield	8.00	8.13
1845	Selma Cotton Oil Co., Selma, N. C.	Jerome	------	8.03
1735	Southern Cotton Oil Co., Goldsboro, N. C.	Goldsboro	8.00	8.26
1737	------do	Edenton	8.00	8.28
1799	-----do	Elm City	8.00	**7.70**
1814	Tar River Oil Co., Tarboro, N. C.	Tarboro	8.00	8.62
1772	Dunn Oil Co., Dunn, N. C.	Goldsboro	7.50	8.01
1773	Lenoir Oil and Ice Co., Kinston, N. C.	Kinston	7.50	8.26
1770	Louisburg Cotton Oil Mill, Louisburg, N. C.	Wake Forest	7.50	8.36
1791	McNally Manufacturing Oil Co., Norfolk, Va.	Edenton	7.50	8.38
1849	N. C. Cotton Oil Co., Wilmington, N. C.	Barnesville	7.50	7.91
1769	------do	Elizabeth City	7.50	7.54
1797	------do	Aulander	7.50	7.52
1872	------do	Enfield	7.50	8.23
1768	Southern Cotton Oil Co., Conetoe, N. C.	Mackey's Ferry	7.50	8.18
1815	-----do	Conetoe	7.50	8.08
1757	Southern Cotton Oil Co., Goldsboro, N. C.	Mount Olive	7.50	8.20
1762	Southern Cotton Oil Co., Tarboro, N. C.	Hobgood	7.50	7.69
1835	Southern Cotton Oil Co., Goldsboro, N. C.	Kenly	7.50	7.84
1783	Southern Cotton Oil Co., Wilson, N. C.	Williamston	7.50	7.82
1798	------do	Elm City	7.50	7.64
1864	------do	Enfield	7.50	7.98
1846	------do	Kenly	7.50	8.58
1865	------do	Wilson	7 50	7.72
1866	------do	do	7.50	8.60
1809	Va.-Car. Chemical Co., Richmond, Va.	Edenton	7.50	7.94

III.

FERTILIZER BRANDS REGISTERED FOR 1903.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
The American Agricultural Chemical Company (New York and Baltimore)—			
Clark's Orinoco Tobacco Fertilizer	8	3	4
Zell's Dissolved Bone Phosphate	14	..	..
Zell's Dissolved Bone Phosphate and Potash	11	..	2
Zell's Calvert Guano	8	2	2
Zell's Ammoniated Bone Superphosphate	8	2	1
Zell's Special Compound for Tobacco	8	2	2
Zell's High Grade Fertilizer	9	2.25	4
Zell's Tobacco Fertilizer	8	3	4
Zell's Truck Grower	7	5	5
Zell's High Grade Tobacco and Vegetable Manure	6	7	5
Reese's Dissolved Phosphate of Lime	14	..	..
Reese's Pacific Guano	8	2	2
Reese's Pacific Guano for Tobacco	8.50	3	2.50
Baker's Dissolved Bone Phosphate	14	..	..
Oriole High Grade Fertilizer	9	2.50	2
Canton Chemical Game Guano	8	2	2
British Mixture	8	2.50	2.50
Genuine German Kainit	..	..	12
Zell's Bright Tobacco Grower	8	3	3
Gold Dust Guano	9	2	2
Cottage Grove Special Truck Guano	6	9	4
Honey Pod Special Trucker	7	5	8
Honey Pod Pride Fertilizer	8	4	5
Pamlico Trucker	7	5	8
Purity Guano	8	2	2
Triumph Soluble Guano	8	2	2
Lazaretto Special for Tobacco and Potatoes	8	3	3
Lazaretto Crop Grower	8	2	2
Lazaretto Special Strawberry Guano	7	5	8
Lazaretto Dissolved Bone Phosphate	14	..	..
Lazaretto Dissolved Bone and Potash	10	..	2
Lazaretto 10 Per Cent Guano	5	10	3
Lazaretto Truckers' Favorite	6	7	5
Lazaretto Early Trucker	7	5	5
Genuine German Kainit	..	..	12
Canton Baker's Dissolved S. C. Bone	14	..	..
Detrick's XXtra Acid Phosphate	14	..	..
Reeses' Crown Phosphate and Potash	11	..	2
Young's XX Melon Fertilizer	10	3	7
Young's Melon Fertilizer	10	3	10
Zell's Special Compound for Potato and Vegetables,	8	3	4
J. H. Roberson Special Potato Guano	7	7	7
Detrick's Special Tobacco Fertilizer	8	3	3
Zell's High Grade Potash Fertilizers	10	..	4
Lazaretto High Grade Dissolved Bone and Potash	11	..	2
George L. Arps & Co., Norfolk, Va.—			
George L. Arps & Co. Premium Guano	8	2.50	2
High Grade Premium Guano	8	2	2

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
George L. Arps & Co. 14 Per Cent Acid Phosphate..	14	..	..
Genuine German Kainit	..	..	12
Ashepoo Fertilizer Company, Charleston, S. C.—			
Ashepoo High Grade Acid Phosphate	13	..	..
Ashepoo XXX Acid Phosphate	13	..	..
Ashepoo High Grade Guano	8	4	4
Ashepoo X Tobacco Fertilizer	8	3	3
Ashepoo Guano	8	2.50	1
Ashepoo Circle Guano	8	2.50	2
Ashepoo Wheat and Oat Specific	9	2	1
Ashepoo XX Guano	8.50	2	2
Ashepoo Fruit Guano	8	4.75	2.75
Ashepoo Golden Tobacco Producer	8	3	3
Ashepoo XX Acid Phosphate	12	..	..
Ashepoo Acid Phosphate	12	..	..
Ashepoo Fertilizer	9	2.25	1
Ashepoo Potash Acid Phosphate	11	..	1
Ashepoo High Grade Ammoniated Superphosphate..	8	3	2
Ashepoo Dissolved Bone	12	..	..
Ashepoo High Grade Acid Phosphate and Potash..	12	..	1
Ashepoo Superpotash Acid Phosphate	10	..	4
Ashepoo Harrow Brand Raw Bone Superphosphate,	9	2	2
Eutaw High Grade Acid Phosphate	13	..	..
Eutaw High Grade Acid Phosphate and Potash	12	..	1
Eutaw Potash Acid Phosphate	11	..	1
Eutaw XX Acid Phosphate	12	..	..
Eutaw Acid Phosphate	12	..	..
Eutaw XX Guano	8.50	2	2
Eutaw Fertilizer	9	2.25	1
Eutaw Circle Guano	8	2.50	2
Carolina Guano	8	2	2
Carolina XXX Guano	8	3	3
Carolina Acid Phosphate	13	..	..
Coomassie Acid Phosphate	12	..	..
Enoree Acid Phosphate	10	..	2
Palmetto Potash Acid Phosphate	11	..	1
Circle Bone	13	..	..
P. D. Fertilizer	8	2	1
German Kainit	..	..	12
Sulphate of Ammonia	..	22	..
Nitrate of Soda	..	18	..
Muriate of Potash	..	..	45
Bronwood Acid Phosphate	8	..	4
Ashepoo Potash Compound	10	..	3
Acme Manufacturing Co., Wilmington, N. C.—			
Acme Ammoniated Dissolved Bone	8	2	1
Acme Acid Phosphate	13	..	..
Gem Fertilizer	8.50	2	2
Tip Top Tobacco Grower	8	2.50	3
Acme Soluble Bone	8	2.50	1
Acme Fertilizer	8	3	2.50
Acme Cotton Fertilizer	8.50	2	2
Acme Special Grain	8.50	2	2
Acme Standard Guano	8	2.50	2
Latimer's Complete Fertilizer	8	2.50	2
Acme Fertilizer for Tobacco	8	3	2.50
Quick Step Fertilizer	8	4	4

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Acme Truck Grower	6	4	8
Nitrate of Soda	..	19	..
Pure German Kainit	..	..	12
Bone and Potash	8	..	4
Bone and Potash	10	..	1
Bone and Potash	10	..	2
Bone and Potash	10	..	3
Bone and Potash	10	..	4
Bone and Potash	11	..	1
Bone and Potash	11	..	2
Bone and Potash	12	..	1
Acme 12 Per Cent Acid Phosphate	12	..	..
Acme 14 Per Cent Acid Phosphate	14	..	..
Atlantic Chemical Co., Norfolk, Va.—			
Atlantic Potato Guano	7	5	5
Atlantic Special Truck Guano	8	4	4
Atlantic Special Guano	8	2	1
Atlantic Soluble Guano	8	2	2
Atlantic Cotton Grower	8	2.50	1
Atlantic Tobacco Compound	8	2.50	2
Atlantic Tobacco Grower	8	2.50	3
Atlantic High Grade Tobacco Guano	8	3	3
Atlantic Acid Phosphate	12	..	..
Atlantic High Grade 14 Per Cent Acid Phosphate	14	..	..
Atlantic High Grade Dissolved Bone	13	..	..
Atlantic Bone and Potash Mixture	10	..	2
Cotton-seed Meal	..	7.50	..
Muriate of Potash	..	..	48
Sulphate of Potash	..	..	48
Nitrate of Soda	..	19	..
Genuine German Kainit	..	..	12
Atlantic 14 Per Cent Acid Phosphate	14	..	..
Atlantic High Grade 16 Per Cent Acid Phosphate	16	..	..
Atlantic Meal Compound	9	2.75	2
American Fertilizing Co., Norfolk, Va.—			
Acid Phosphate	10	..	..
Eagle High Grade Acid Phosphate	13	..	..
Acid Phosphate	12	..	..
High Grade Acid Phosphate	14	..	..
American High Grade Acid Phosphate	16	..	..
Double Dissolved Bone and Potash	10	..	4
Ten Per Cent (10 Per Cent) Ammonia Guano	6	10	2
Standard Seven Per Cent (7 Per Cent) Am. Guano,	7	7	5
Strawberry Guano	9	3.50	9
Low Grade Special Formula	7	4	4
Peruvian Mixture	8	2	1.50
Blood and Bone Compound	8	2.50	1
American Ammoniated Bone	8	2	1
Bone and Peruvian Guano	8	2	2
American Eagle Guano	8	3	3
Dissolved Bone and Potash	10	..	3
Pitt County Special Fer. for Yellow Leaf Tob	9	3.50	5
Fish Scrap	..	10	..
Pure Dissolved Bone	14	2.50	..
Tankage	..	7	..
Stable Manure Substitute	7	3	4
Genuine German Kainit	..	..	12

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Bone Meal .....(Total)	21	3.50	..
Sulphate of Ammonia.....	..	25	..
Nitrate of Soda.....	..	19	..
Sulphate of Potash.....	..	..	49
Muriate of Potash.....	..	..	50
Special Formula for Yellow Leaf Tobacco Guano..	9	3.50	5
High Grade Special Formula Guano.....	8	10	5
J. G. Miller & Co., Yellow Leaf Fertilizer.....	8	3	3
A. L. Hannah's Special Formula Guano.....	8	2	2
Dissolved Bone and Potash for Corn and Wheat...	10	..	2
Bob White Fertilizer for Tobacco.....	8	2.50	2.50
Bone and Peruvian Guano for Tobacco.....	8	2	2
Special Potato Guano.....	7	5	7
American 7-7-7 for Potatoes.....	7	7	7
American Irish Potato Grower.....	7	5	5
Peruvian Mixture for Tobacco.....	8	2	2
Special Potato Manure.....	6	5	7
American Cotton Compound	8	2	2
Special Irish Potato Guano.....	8	8	6
Peruvian Mixture Guano, especially prepared for Sweet Potatoes	8	4	5
Blalock's H. G. Guano.....	8	3	3
Murray's Special Fertilizer.....	8	3	3
The Armour Fertilizer Works, Baltimore—			
Bone and Dissolved Bone with Potash.....	9	2	3
Ten Per Cent Trucker.....	5	10	3
Seven Per Cent Trucker.....	6	7	5
All Soluble	8	3.50	4
High Grade Manure for Light Soil.....	6	5	5
Bone, Blood and Potash.....	8	5	7
Ammoniated Bone with Potash.....	6	3	2
Tobacco Special	8	3	3
Dried Blood	..	16	..
General	8	2	2
Phosphate and Potash No. 1.....	10	..	2
Phosphate and Potash No. 2.....	8	..	5
Thirteen Per Cent Acid Phosphate.....	13	..	..
Manure Substitute	6	4	4
Star Phosphate	14	..	..
Armour's Champion	8	2.50	2.50
Little Sam's Big Tobacco Grower.....	8	3.50	6
Kainit	..	..	12
Raw Bone Meal.....(Total)	24	3	..
Raw Bone Meal.....(Total)	22	4.50	..
Sulphate of Potash.....	..	..	52
Nitrate of Soda.....	..	19	..
Muriate of Potash.....	..	..	50
Valley Brand Tobacco	8	2	5
High Grade Potato.....	8	2	10
King Cotton	8	2.50	1
Armour's Cotton Special.....	8	3	3
Phosphoric Acid and Potash.....	10	..	5
Bradley Fertilizer Co., Charleston, S. C.—			
B. D. Sea Fowl Guano.....	9	2.25	1
Bradley's Patent Superphosphate.....	9	2.25	1
Bradley's Ammoniated Dissolved Bone.....	8	2.25	1
Bradley's XXX Acid Phosphate.....	13	..	..

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Bradley's Acid Phosphate	12	..	..
Bradley's Palmetto Acid Phosphate	12	..	..
Eagle Ammoniated Bone Superphosphate	8	2.25	1
German Kainit	..	..	12
John L. Bailey & Co., Elm City, N. C.—			
Fairmount Guano	8	3	3
Stag Brand Guano	8	2	2
J. A. Benton, Ruffin, N. C.—			
N. C. Bright Tobacco Fertilizer	9	2	2
James Bonday, Jr., & Co., Baltimore, Md.—			
Old Reliable Brand Genuine German Kainit	..	..	12
Nitrate of Soda	..	18	..
Syndikat Sulphate of Potash	..	..	48
No. 1 Syndikat Muriate of Potash	..	..	50
Best & Thompson, Goldsboro, N. C.—			
Genuine German Kainit	..	..	12
Baugh & Sons Co., Norfolk, Va.—			
Baugh's Pure Dissolved Animal Bone	13	2.50	..
Baugh's Raw Bone Meal (Total)	21.50	4.50	..
Baugh's New Process 10 Per Cent Guano	5	10	2.50
Baugh's Cabbage Guano	6	7	5
Baugh's 7 Per Cent Potato Guano	6	7	5
Baugh's Peruvian Guano Substitute	6	5	7
Baugh's Fruit and Berry Guano	8	3	10
Grand Rapid Guano	8	3	3
Baugh's High Grade Tobacco Guano	8	3	3
Baugh's Animal Bone and Potash Com. for all Crops,	8	2	2
Baugh's Fish Mixture	8	2	2
The Old Standby, Baugh's Raw Bone Superphosphate and Ammoniated Animal Bone	8	2	1
Baugh's Special Cotton Guano	8	2	..
Bone Tanking	..	9	..
Nitrate of Soda	..	19	..
Muriate of Potash	..	..	50
Baugh's Sulphate of Ammonia	..	25	..
Fine Ground Fish	..	10	..
Sulphate of Potash	..	..	50
Baugh's Fertilizer Chemical	8	2	1
Genuine German Kainit	..	..	12
Baugh's Soluble Alkaline Superphosphate	10	..	2
Baugh's High Grade Acid Phosphate	14	..	..
Baugh's 16 Per Cent Acid Phosphate	16	..	..
Baugh's 5-6-5 Guano	6	5	5
Baugh's Double Eagle Phos. from Slaughter House,	8	2	1
Baugh's Fish Bone and Potash	7	4	4
Mason Guano	8	2.50	3.50
The Berkley Chemical Co., Norfolk—			
Mascot Truck Guano	7	5	5
Berkley Tobacco Guano	8	3	3
Berkley Acid Phosphate	14	..	..
Advance Crop Grower	8	3	3
Monitor, Animal Bone	9	2.25	4

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Select Crop Grower	8.50	2.50	2.50
Berkley Bone and Potash Mixture	11	..	2
Berkley Ammoniated Superphosphate	8	2	1
Brandon Superphosphate	8	2	2
Berkley Genuine German Kainit	..	..	12
William Bragaw & Co., Washington, N. C.—			
Tuckahoe Tobacco Guano	8	2.50	3
Tar Heel Special Guano	8	2	2
Beaufort County Guano	8	3	3
Havana Tobacco Guano	8	3	3
Old Reliable Premium	8	2	2
Chocowinity Special Tobacco Fertilizer	5	4	6
Genuine German Kainit	..	..	12
Bell, Westbrook & Journey, Beaufort, N. C.—			
Ground Fish Scrap	..	9	..
Baltimore Pulverizing Co., Baltimore, Md.—			
Penniman's Cotton Fertilizer	8	2	2
Penniman's Fertilizer	9	..	2
Cumberland Bone Phosphate Co., Portland, Me., and Charleston, S. C.—			
Cumberland Bone Phosphate of Lime	8	2.25	1
Calder Bros., Wilmington, N. C.—			
Muriate of Potash	..	..	50
Genuine German Kainit	..	..	12
Nitrate of Soda	..	19	..
W. H. Camp, Petersburg, Va.—			
Camp's Prepared Chemical No. 1	8	3.50	7.50
Camp's Prepared Chemical No. 3	8	2.75	1
Columbia Guano Co., Norfolk, Va.—			
Columbia Special Truck Guano	8	4	4
Columbia Potato Guano	7	5	5
Carolina Soluble Guano	8	2	1
Columbia Soluble Guano	8	2	2
Rex Brand Ammoniated Guano	8	2.50	1
Columbia High Grade Special Tobacco Guano	8	2.50	2
Hyco Tobacco Guano	8	3	3
Genuine German Kainit	..	..	12
Columbia Acid Phosphate	12	..	..
Columbia High Grade Dissolved Bone	13	..	..
Cotton-seed Meal	..	7.50	..
Nitrate of Soda	..	19	..
Sulphate of Potash	..	..	48
Muriate of Potash	..	..	48
Columbia 14 Per Cent Acid Phosphate	14	..	..
Columbia High Grade 16 Per Cent Acid Phosphate,	16	..	..
Columbia Bone and Potash Mixture	10	..	2
Columbia C. S. M. Special	9	2.75	2
H. & D. Ammoniated Guano	8	2	2
H. & D. High Grade Dissolved Bone	13	..	..
H. & D. Special Ammoniated Fertilizer	9	3	2.25
Columbia Special Wheat Mixture	8	..	4

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.—			
Comet Guano	8	2	1
Eli Ammoniated Fertilizer	8	2	2
Eclipse Ammoniated Guano	8	2.50	2
Pacific Tobacco and Cotton Grower	9	2.75	2
Planter's Pride	8	2.50	3
Caraleigh Special Tobacco Guano	8	2.50	3
Horne's Best	8	3	3
Crown Ammoniated Guano	8	2	1.50
Staple Acid Phosphate	12	..	..
Horne's High Grade Bone and Potash	11	..	5
Electric Bone and Potash Mixture	10	..	2
Morris & Scarboro's Special Bone and Pot. Mixture,	10	..	3
Climax Dissolved Bone	14	..	..
Sterling High Grade Acid Phosphate	13	..	..
Dandy Acid Phosphate	10	..	..
Nitrate of Soda	..	19	..
Muriate of Potash	..	..	50
Sulphate of Potash	..	..	50
Genuine German Kainit	..	..	12
Cowell, Swan & McCotter Co., Bayboro, N. C.—			
Cowell, Swan & McCotter Co. Potato Favorite Guano	7	4	7
Cowell, Swan & McCotter Co. Crop Guano	8	2	2
Cowell, Swan & McCotter Co. Cabbage Guano	5	10	2.50
Cowell, Swan & McCotter Co. Quick Grower Guano,	8	2.50	3
Cowell, Swan & McCotter Co. High Grade Truck Guano	7	5	5
Cowell, Swan & McCotter Co. Bone and Fish Guano,	8	2	2
Cowell, Swan & McCotter Co. Bone Phosphate	14	..	..
Cowell, Swan & McCotter Co. German Kainit	..	..	12
Cowell, Swan & McCotter Co. Potato Guano	8	2.50	3
Cowell, Swan & McCotter Co. Tobacco Guano	8	3	3
Cowell, Swan & McCotter Co. Rust Proof Cotton Guano	8	2	3
Cowell, Swan & McCotter Co. Stand. Cotton Grower,	8	4	4
Combahee Fertilizer Co., Charleston, S. C.—			
Combahee Melon Fertilizer	10	3	7
Continental Commercial Co., Baltimore, Md.—			
Truckers' High Grade Compound	7	7	5
Cotton Oil and Fibre Co., Norfolk, Va.—			
(Cofco.) Cotton-seed Meal	..	7.50	..
Consumers' Cotton Oil Co., Tarboro, N. C.—			
Cotton-seed Meal	..	8	..
Crow Bros., Monroe, N. C.—			
Crow Bros.' 13 Per Cent Acid	13	..	..
Crow Bros.' Grain Mixture	10	..	2
Dey & Bro., Beaufort N. C.—			
Ground Fish Scrap	..	10	..

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
The Dunn Oil Co., Dunn, N. C.—			
Cotton-seed Meal	..	7.50	..
Etiwan Fertilizer Co., Charleston, S. C.—			
Etiwan Guano	8	2.50	1
Etiwan Ammoniated Dissolved Bone	9	2	2
Etiwan Cotton Compound	8	3	3
Etiwan Dissolved Bone	13	..	..
Etiwan Acid Phosphate with Potash	11	..	1
Etiwan Potash Bone	10	..	4
Etiwan Soluble Bone with Potash	10	..	3
Etiwan Special Potash Mixture	8	..	4
Genuine German Kainit	..	..	12
XX Acid Phosphate with Potash	10	..	2
Plow Brand Raw Bone Superphosphate	8	2.50	1
Plow Brand Special Tobacco Fertilizer	8	4	4
Plow Brand Ammoniated Dissolved Bone	9	2	2
Plow Brand Acid Phosphate with Potash	11	..	1
Diamond Soluble Bone	13	..	..
Diamond Soluble Bone with Potash	10	..	2
Etiwan Ammoniated Fertilizer	8	2	2
Farmers Guano Co., Raleigh, N. C.—			
State Standard Guano	8	2	2
Century Bone and Potash Mixture	10	..	2
Golden Grade Guano	8	3	3
Toco Tobacco Guano	8	2.50	3
Farmers' High Grade Acid Phosphate	13	..	..
Big Crop	8	2.50	3
Green & Yarboro, Louisburg, N. C.—			
Green & Yarboro's High Grade Fertilizer	8	2.50	2
Griffith & Boyd, Baltimore, Md.—			
High Grade Triumph Guano	8	2	2
J. C. Hadley & Co., Wilson, N. C.—			
John Hadley's Special High Grade Plant Food	8	2	2
Hadley's Boss Guano	8	2.75	2.50
Haven's Oil Co., Washington, N. C.—			
Cotton-seed Meal	..	8	..
S. P. Harrell & Co., Norfolk, Va.—			
Harrell's Champion Cotton and Peanut Grower	8	2	2
Harrell's Acid Phosphate	14	..	..
Harrell's Truck Guano	6	7	5
Home Fertilizer Chemical Works, Baltimore, Md.—			
Boykin's Potato Grower	8	4	4
Phœnix Crop Grower	8	3	2
Boykin's Dissolved Animal Bone	12	2	..
Yancey's Formula for Yellow Leaf Tobacco	8	3	2
Home Fertilizer	..	7	7
Boykin's Cereal Fertilizer	8	2	2
Cerealite Top Dressing	..	9	2.50
Genuine German Kainit	..	..	12

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Sulphate of Potash	..	..	48
Muriate of Potash	..	..	50
Sulphate of Ammonia	..	25	..
Nitrate of Soda	..	19	..
Boykin's Alkaline Bone	10	..	2
Everybody's Fertilizer	9	..	2
High Grade Acid Phosphate	14	..	..
Home Potato Grower	6	4	4
Boykin's Dissolved Bone Phosphate	14	..	..
The Hampton Guano Co., Norfolk, Va.—			
Reliance Truck Guano	7	5	5
Hampton Acid Phosphate	14	..	..
Hampton Bone and Potash Mixture	11	..	2
Hampton Ammoniated Superphosphate	8	2	1
Hampton Tobacco Grower	8	3	3
Hampton Genuine German Kainit	..	..	12
Shirley Superphosphate	8	2	2
Arlington Animal Bone Fertilizer	9	2.25	4
Alpha Crop Grower	8.50	2.50	2.50
PPP Princess Prolific Producer	8	3	3
Highland Park Manufacturing Co., Charlotte, N. C., and Rock Hill, S. C.—			
Cotton-seed Meal	..	8	..
The Imperial Co., Norfolk, Va.—			
Cubanola Tobacco Guano	4	3	5
Imperial Tobacco Guano	8	3	3
Imperial Peanut and Corn Guano	8	2	2
Imperial Standard Premium	8	2	1.50
Imperial 7 Per Cent Guano for Potatoes and Early Truck	5	7	5
Imperial Champion Guano	8	2	2
Imperial Big Chief Tobacco	8	2	2
Imperial Cotton Grower	8	2	1.50
Imperial Fish and Bone Guano	6	4	4
Imperial Laughinghouse's Special Tobacco Guano	4	4	6
Imperial Cisco Soluble Guano	8	2	2
Imperial High Grade Acid Phosphate	14	..	..
Imperial High Grade Tenn. Acid Phosphate	16	..	..
Imperial Bone and Potash	10	..	2
Imperial Special 10 Per Cent Guano	5	10	2.50
Imperial 3-8-3 Ammoniated Guano	8	3	3
German Kainit	..	..	12
Muriate of Potash	..	..	50
Williams' Special Potato Guano	6	5	5
Imperial 5-7-8 Truck Guano	7	5	8
Hyman's Choice Guano	4	4	6
H. H. Proctor's Special Guano	8	3	3
Folk's Peanut and Corn Guano, Manufactured for E. L. Folk & Co	8	2	3
Imperial Guano for Bright Tobacco	8	2.50	3
Nitrate of Soda	..	19	..
High Grade Excelsior Guano	8	2	2
Tucker's Delight for all Crops	8	2	2
Tucker's Favorite Tobacco Guano	8	2.50	3
Tucker's Special Tobacco Guano	8	3	3
Imperial High Grade Irish Potato Guano	7	5	8

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Imperial Special Tobacco Guano	8	3	3
Imperial H. G. Tennessee Acid Phosphate	16	..	..
Williams' Potato Mixture, Manufactured for Williams Bros., Norfolk, Va	6	5	5
Martin County Special Crop Grower	9	2.75	2
Imperial Corn Grower	10	..	2
Imperial 5-6-7 Potato Guano	6	5	7
Imperial Seven Per Cent Guano for Potatoes	6	7	6
Williams' Tobacco Guano	8	3	8
Imperial Top Dresser for Grass	..	12	..
Imperial Sweet Potato Guano	6	2	6
C. L. Folk & Co.'s Peanut and Corn Guano	8	2	2
The Independent Cotton Oil Co., Darlington, S. C.; Cheraw, S. C., and Wadesboro, N. C.—			
Cotton-seed Meal	..	8	..
Jamestown Bone Meal Co., Jamestown, N. C.—			
Bone Meal (Total)	21.50	3.50	..
Lynchburg Guano Co., Lynchburg, Va.—			
Lynchburg Soluble	8	2	2
Lynchburg Soluble for Tobacco	8	2	2
Lynchburg Dissolved Bone and Potash	10	..	2
Lynchburg High Grade Acid Phosphate	14	..	..
New Era	8	2	1
Alpine Mixture	10	..	5
Ironside Acid Phosphate	16	..	..
Arvonia Acid Phosphate	13	..	..
Spartan Acid Phosphate	12	..	..
Otter Brand Acid Phosphate	10	..	..
Golden Age Pure Bone Meal (Total)	20	4	..
Independent Standard	8.50	2	2
Solid Gold Tobacco	8	2.75	4
Genuine German Kainit	..	..	12
Bright Belt Guano	8	2	..
Buffalo Guano	8	2.50	3
S. W. Special Bone and Potash Mixture	10	..	4
A. S. Lee & Son, Richmond, Va.—			
Wheat Fertilizer	9	..	1
Lee's Corn Fertilizer	9	..	1
Lee's High Grade Bone and Potash	9	..	4
Lee's Prepared Agricultural Lime	..	..	2
A. H. Lindsay, Portsmouth, Va.—			
Cumberland Guano	8	4	4
Lister A. C. Works, Newark, N. J.—			
Lister's Ammoniated Dissolved Bone Phosphate	8	2.50	2
Success Fertilizer	2	2	2
Lister's Potato Manure	8	4	7
Lister's Harvest Queen	9	2	2
Lister's 10 Per Cent Guano	10	4	4
Lenoir Oil and Ice Co., Kinston, N. C.—			
Cotton-seed Meal	..	7.50	..

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Laurinburg Oil Mill, Laurinburg, N. C.—			
Cotton-seed Meal	..	7.50	..
Miller Fertilizer Co., Baltimore, Md.—			
Miller's Irish Potato	8	4	4
High Grade Potato	6	5.50	7
Potato and Vegetable Grower	8	2	4
Trucker's Profit	8	4	4
Standard Phosphate	8	3	3
Ammoniated Dissolved Bone	8	2	2
E. H. & J. A. Meadows Co., New Bern, N. C.—			
Meadows' Sea Bird Guano	8	4	2.50
Meadows' All Crop Guano	8	2.50	2.50
Meadows' Labas Guano	8	5	5
Meadows' Cotton Guano	8	2	2
Meadows' Great Potato Guano	7	5	8
Meadows' Great Cabbage Guano	7	7	7
Meadows' 10 Per Cent Ammoniated Guano	6	10	2
Meadows' Diamond Acid Phosphate	14	..	..
Meadows' Dissolved Bone and Potash Compound	10	..	2
Meadows' Gold Leaf Tobacco Guano	8	3	3
The Mapes' Formula and Peruvian Guano Co., N. Y.—			
Mapes' Potato Manure	8	4.50	6
Mapes' Fruit and Vine Manure	5	2	10
Mapes' 10 Per Cent Truck Special	2	10	4
Mapes' Economical Potato Manure	4	4	8
Mapes' Complete Manure, "A" Brand	10	3	2.50
Mapes' Soluble Potato Manure	2	7	5
Mapes' Vegetable Manure or Complete Manure for Light Soils	6	6	6
Edmund Mortimer & Co., New York—			
Genuine Peruvian Guano	11.50	2.84	1.15
Genuine Peruvian Guano (Total)	20	4	3.80
The W. C. McMurphy Co., Charleston, S. C.—			
Acid Phosphate and Potash	10	..	2
Truck Farmers' Special Guano	10	4	4
Truckers' Special 6-5-6 Vegetable Guano	6	5	6
Special 8-2-2 Cotton and Corn Guano	8	2	2
Wilcox, Gibbs & Co.'s Manipulated Guano	9	2.75	2
Truckers' Special Potato Guano	7	4	5
High Grade Acid Phosphate	13	..	..
Excellent Cotton and Corn Guano	8	2	2
Special 8-3-3 Tobacco Guano	8	3	3
Doubly Ammoniated Truck Farmers' Special Guano,	8	8	4
Sulphate of Ammonia	..	25	..
Muriate of Potash	..	..	48
Nitrate of Soda	..	19	..
Sulphate of Potash	..	..	48
Genuine German Kainit	..	..	12
Special 8-5-7 Guano	8	5	7
Special 9-3-3 Guano	9	3	3
Special 8-2½-2 Cotton and Corn Guano	8	2.50	2

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
R. J. Madry, Scotland Neck, N. C.—			
Madry's Special Tobacco Fertilizer	8	3	3
Madry's Acid Phosphate	14	..	..
Pure German Kainit	..	..	12
W. A. Murray & Co., Mebane, N. C.—			
Murray's Special Fertilizer	8	3	3
McNally Manufacturing Co., Norfolk, Va.—			
Cotton-seed Meal	..	7.50	..
Navassa Guano Co., Wilmington, N. C.—			
Coree Tobacco Guano	8	4	4
Clarendon Tobacco Guano	8	3	3
Navassa Guano for Tobacco	8	2.50	2
Navassa Special Truck Guano	8	4	4
Navassa Complete Fertilizer	8	2	1
Navassa Cotton Fertilizer	8	2	2
Navassa Fruit Growers' Fertilizer	8	2	6
Navassa Strawberry Top Dressing	8	2.50	4
Navassa Root Crop Fertilizer	7	5	7
Navassa Universal Fertilizer	8	2.50	1
Navassa Grain Fertilizer	8	2	2
Navassa Cotton-seed Meal Special 3 Per Cent	8	3	2
Navassa Cotton-seed Meal Guano	8	2	2
Navassa Special Wheat Mixture	12	..	4
Navassa Wheat and Grass Grower	10	..	4
Navassa Acid Phosphate	12	..	..
Navassa Dissolved Bone and Potash	10	..	2
Navassa Bone and Potash	8	..	2
Navassa High Grade Dissolved Bone	13	..	..
Navassa Acid Phosphate with Potash	10	..	1
Navassa Grey Land Mixture	12	..	4
Navassa Wheat Fertilizer	10	..	2.25
Warlick's Mixture	8	..	2.25
Croatan Acid Phosphate	10	..	..
Ammoniated Soluble Navassa Guano	8	2.50	2
Harvest King Guano	8	2	3
Harvey's Bone and Potash Mixture	8	..	3
Occoneechee Tobacco Guano	8	2	2
Genuine German Kainit	..	..	12
Navassa Special 3 Per Cent Guano	8	3	2
North Carolina Cotton Oil Co., Raleigh, N. C.—			
Cotton-seed Meal	..	8	..
Raleigh Standard Guano	8	2.75	2
North Carolina Cotton Oil Co., Wilmington, N. C.—			
Cotton-seed Meal	..	7.50	..
North Carolina Cotton Oil Co., Charlotte, N. C.—			
Cotton-seed Meal	..	8	..
North Carolina Cotton Oil Co., Henderson, N. C.—			
Cotton-seed Meal	..	8	..
G. A. Norwood, Jr., Goldsboro, N. C.—			
Pure German Kainit	..	..	12

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
New Bern Cotton Oil and Fertilizer Mills, New Bern, N. C.—			
Craven Special Guano	8	2.50	3
Craven Cotton Guano	8	2	2
Craven Bright Tobacco Guano	8	3	3
High Grade Acid Phosphate	14	..	..
Pure German Kainit	..	..	12
Cotton-seed Meal	..	8	..
G. Ober & Sons Co., Baltimore, Md.—			
Ober's Farmers' Standard Ammoniated Phosphate,	8	2	2
Ober's Special Ammoniated Dissolved Bone	9	2	2
Ober's Standard Tobacco Fertilizer	8	2	2
Ober's Special Cotton Compound	8	2	2
Ober's Special High Grade Fertilizer	9	3	3
Ober's Special Compound for Tobacco	8	3	3
Ober's Dissolved Bone Phosphate and Potash	10	..	2
Ober's Dissolved Bone Phosphate	14	..	..
Muriate of Potash	..	..	50
Nitrate of Soda	..	18	..
Kainit	..	..	12
Ober's Complete Fertilizer	6	5	6
Pacific Guano Co., Charleston, S. C.—			
Soluble Pacific Guano	8.50	2	2
Pacific Special High Grade Guano	8	3	3
Pacific Acid Phosphate	12	..	..
Parker & Hunt, Oxford, N. C.—			
Parker & Hunt's Special Tobacco Fertilizer	9	2.50	1.50
Blood and Bone Mixture	8	2	1
Parker & Hunt's Bone and Potash Mixture	10	..	2
W. S. Powell & Co., Baltimore, Md.—			
Powell's Prepared Chemicals for Composting	6	2.25	7
Powhatan Chemical Co., Richmond, Va.—			
P. C. Co.'s Hustler	8	3	3
White Leaf Tobacco Fertilizer	8	2.50	3
King Brand Fertilizer	8	2.50	3
Economic Cotton Grower	9	2.75	2
Magic Tobacco Grower	8	2	2
Magic Special Fertilizer	8	2	2
Magic Cotton Grower	8	2	2
Magic Brand Ammoniated Phosphate	8	2	1
Magic Bone and Potash Mixture	10	..	4
Powhatan Bone and Potash Mixture	8	..	4
Bone and Potash Mixture	10	..	2
Magic Dissolved Bone Phosphate	16	..	..
High Grade Acid Phosphate	14	..	..
Powhatan Acid Phosphate	13	..	..
Virginia Dissolved Bone	12	..	..
Magic S. C. Phosphate	10	..	..
Pure Raw Bone Meal (Total)	20	4	..
Pure German Kainit	..	..	12
P. C. Company's Truck Fertilizer	7	6	5
Guilford Special Tobacco Fertilizer	9	3	6
Dixie Grain and Grass Grower	8	..	2

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Patapsco Guano Co., Baltimore, Md.—			
Patapsco Trucker for Early Vegetables	7	5	5
Patapsco Tobacco Fertilizer	9	3	3
Patapsco Special Tobacco Mixture	8	2.50	3
Patapsco Guano	9.25	2.50	2
Patapsco Guano for Tobacco	9.25	2.50	2
Patapsco High Grade Bone and Potash	11	..	5
Patapsco Soluble Bone and Potash	10	..	2
Patapsco Dissolved S. C. Phosphate	14	..	..
Unicon Guano	8	2.50	3
Choctaw Guano	8	3	3
Baltimore Soluble Phosphate	11	..	2
Planter's Favorite	8	2	2
Sea Gull Ammoniated Guano	8	2	2
Genuine German Kainit	..	..	12
Tobacco Planters' Money-maker, Manufactured for G. E. Harris, Greenville, N. C	7	4.50	6
Florida Soluble Phosphate	16	..	..
Patapsco Pure Ground Bone (Total)	20.61	4.50	..
Pocahontas Guano Co., Lynchburg, Va.—			
Carrington's Banner Brand Guano	8	2	2
Grain Special Bone and Potash, New Rival Brand	10	..	1.65
Carrington's Superior Grain Compound	10	..	2
Yellow Tobacco Special	9	2	2
Standard Tobacco Guano, Old Chief Brand	9	2	2
Pocahontas Special Tobacco Fertilizer	9	3	3
Spot Cash Tobacco Compound	8	2.50	3
High Grade 4 Per Cent Tobacco Compound (Mohawk King Brand)	9	2.25	4
Pure Raw Bone Meal (Total)	22	4.50	..
Imperial Dissolved S. C. Phosphate	14	..	..
The Pocomoke Guano Co., Norfolk, Va.—			
Peerless Acid Phosphate	14	..	..
Alkali Bone	11	..	2
Pamlico Superphosphate	8	2	2
Electric Crop Grower	8.50	2	2
Pocomoke Superphosphate	8.50	2	2
Crescent Complete Compound	8	2	2
Cinco Tobacco Grower	8.50	2.50	2.50
Harvey's High Grade Monarch	8	3	3
Monarch Tobacco Grower	8	3	3
Monticello Animal Bone Fertilizer	9	2.25	4
Seaboard Popular Trucker	6	7	5
Coast Line Trucker	5	10	3
Freeman's 7 Per Cent Irish Potato Grower	6	7	5
Standard Truck Guano	7	5	5
Genuine German Kainit	..	..	12
L. P. H. Premium	8	2	2
Hornthal's Tobacco Guano	2	2	3
Pure Ground Bone (Total)	20	4.50	..
Piedmont-Mt. Airy Guano Co., Baltimore, Md.—			
Piedmont Guano for Tobacco	8	2.50	3
Piedmont Essential Tobacco Compound	9	2	2
Levering's Reliable Tobacco Guano	8	3	3
Piedmont Guano for Cotton	8	2	1

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Piedmont Special for Cotton, Corn and Peanuts....	8	2	2
Piedmont Potato Producer.....	5	3	6
Mt. Airy Garden and Truck Fertilizer.....	8	4	3
Piedmont Special Truck Fertilizer.....	5	7	6
Ten Per Cent Piedmont Guano for Truck.....	5	10	3
Piedmont Red Leaf Tobacco Guano.....	8	2	2
Piedmont Plow Brand.....	8	2	2
Piedmont Special Farmers' Tobacco Guano.....	8.40	3	4
Piedmont Excelsior Tobacco Guano.....	9.25	3	3
Piedmont Farmers' High Grade Bone and Potash..	10	..	2
Piedmont Soluble Bone and Potash.....	8	..	2
Piedmont Dissolved Bone Phosphate, Bone Black..	10.50	..	1
Piedmont Special Potash Goods.....	10	..	5
Piedmont High Grade S. C. Bone.....	14	..	..
German Kainit	..	..	12
Muriate of Potash.....	..	..	50
Upshur's G. G. and C. Grain, Grass and Cotton Grower	8	2	2
Upshur's F. C. Farmers' Challenge Guano.....	8	7	6
Upshur's Norfolk Special 10 Per Cent Guano.....	5	10	2
Upshur's 5 Per Cent Guano.....	5	5	5
Upshur's 7 Per Cent Irish Potato Guano.....	6	7	5
Upshur's F. F. Farmers' Favorite Guano.....	8	5	6
Pine Level Oil Mill Co., Pine Level, N. C.—			
Cotton-seed Meal	..	7.50	..
The Quinnipiac Co., Charleston, S. C.—			
Quinnipiac Acid Phosphate.....	13	..	..
Quinnipiac Pine Island Ammoniated Superphosphate	9	2.25	1
F. S. Royster Guano Co., Norfolk, Va.—			
Truckers' Delight	8	4	4
Ballentine's Potato Guano.....	6	7	7
Royal Potato Guano.....	7	5	5
Orinoco Tobacco Guano.....	8	2.50	3
Royster's High Grade Special Tobacco Guano.....	8	3	3
Farmers' Bone Fertilizer.....	8	2	2
Arrow Brand Guano.....	8	2.50	1
Special Compound	8	2	1
Caledonia Compound	8	2	1
Cooper's Pungo Guano.....	8	2.50	2
John Hadley's Special Guano.....	8	2	2
Royster's XX Acid Phosphate.....	12	..	..
Royster's High Grade Dissolved Bone.....	13	..	..
Harvey's Potash Mixture.....	8	..	3
Carolina Bone and Potash.....	8	..	2
Cotton-seed Meal	..	7.50	..
Genuine German Kainit.....	..	..	12
Nitrate of Soda.....	..	19	..
Sulphate of Potash.....	..	..	48
Muriate of Potash.....	..	..	48
Tobacco Compound	8	2.50	2
Royster's 14 Per Cent Acid Phosphate.....	14	..	..
Royster's H. G. 16 Per Cent Acid Phosphate.....	16	..	..
Royster's Bone and Potash Mixture.....	10	..	2
Bonanza Tobacco Guano.....	8	3	3
Orinoko Tobacco Guano.....	8	2.50	3

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Royster's Meal Mixture	9	2.75	2
Royster's Special Sweet Potato Grower	8	3	3
Royster's Special Truck Guano	7	7	7
Royster's Early Truck Guano	7	5	8
Royal Special Potato Guano	7	5	7
Royster's Special Wheat Mixture	8	..	2.25
Rasin Monumental Co., Baltimore, Md.—			
Rasin's Empire Guano	8	2	2
Rasin's Dixie Guano	8	2	1
Rasin's Acid Phosphate	14	..	..
Richmond Guano Co., Richmond, Va.—			
Special High Grade for Truck	7	6	5
Southern Trucker	8	5	5
Carter's Special Tobacco Fertilizer	4	3	6
Gilt Edge Fertilizer	8	3	3
Carolina Bright Special Tobacco Fertilizer	8.50	2.75	2.25
Burton's Special Tobacco Fertilizer	9	2.50	3
Tip Top Fertilizer	8	2.50	3
Carolina Cotton Grower	9	2.75	2
Special Premium Brand for Tobacco	8	2.25	2.25
Premium Tobacco Fertilizer	8	2	2
Premium Brand Fertilizer	8	2	2
Bone Mixture	8	2	1
Premium Bone and Potash Mixture	13	..	3
Rex Bone and Potash Mixture	10	..	4
Tip Top Bone and Potash Mixture	8	..	4
Bone and Potash Mixture	10	..	2
Alkaline Bone	10	..	2
Special Potash Mixture	8	..	2
Rex Dissolved Bone Phosphate	16	..	..
High Grade Acid Phosphate	14	..	..
High Grade Wheat and Grass Fertilizer	14	..	..
Premium Dissolved Bone	13	..	..
Old Homestead Dissolved Bone	10	..	..
Pure German Kainit	..	..	12
Pure Raw Bone Meal (Total)	20	4	..
Dissolved S. C. Phosphate	12	..	..
Hunter & Dunn's Dissolved Bone	13	..	..
Hunter & Dunn's Ammoniated Fertilizer	8	2	2
Hunter & Dunn's Special Ammoniated Fertilizer	9	3	2.25
Premium Peanut Grower	8	..	4
Premium Grain and Grass Grower	8	..	2
Bone Meal (Total)	25	3	..
Read Phosphate Co., Charleston, S. C.—			
Read's Blood and Bone No. 1	8	2	2
Read's Cotton Flower Guano	8	2.50	1
Read's Soluble Fish Guano	8.50	2	2
Read's High Grade Acid Phosphate	13	..	..
Read's Tobacco Leaf	8	3	3
Read's Alkaline Bone	10	..	2
Read's Bone and Potash	10	..	4
German Kainit	..	..	12
Rowland Oil and Fertilizer Co., Rowland, N. C.—			
Cotton-seed Meal	..	8	..

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Reidsville Fertilizer Co., Reidsville, N. C.—			
Broad Leaf Tobacco Guano	8	2.25	2.50
Bone and Potash	8	..	4
Bone and Potash	8	..	2
Bone and Potash	10	..	4
Royal Fertilizer	8	3	3
Banner Fertilizer	8	2	1
Lion Brand Fertilizer	9	3	6
Champion Fertilizer	8	2	2
Reynolds Fertilizer Co., Bristol, Va. and Tennessee—			
Reynolds' Pure Raw Bone Meal.....(Total)	23	4.50	..
Jacob Reese, Philadelphia, Pa.—			
Odorless Phosphate or Basic Slag	20	..	2
The Southern Cotton Oil Co., Conetoe, Wilson, Gibson, Fayetteville, Goldsboro, Tarboro, Rocky Mount, Monroe, N. C.; Union, Dillon and Florence, S. C.—			
Cotton-seed Meal	..	7.50	..
The Southern Cotton Oil Co., Shelby—			
Cotton-seed Meal	..	7.80	..
The Southern Cotton Oil Co., Charlotte, Davidson, Gastonia and Concord—			
Cotton-seed Meal	..	8	..
R. N. Sweet, Wilmington, N. C.—			
German Kainit	..	..	12
South Carolina Cotton Oil Co., Columbia, S. C., and Greenville, S. C.—			
Cotton-seed Meal	..	7.50	..
Swift Fertilizer Works, Atlanta, Ga.—			
Swift's Special H. G. Guano	9.25	5	3
Swift's Monarch H. G. Guano	8	4	4
Swift's Pioneer H. G. Tobacco Guano	8	2	4
Swift's Cotton King H. G. Guano	9	3	2
Swift's Eagle H. G. Guano	10	2	2
Swift's Golden Harvest Standard Grade Guano	8	2	2
Swift's Red Steer Standard Grade Guano	8	2	2
Swift's Cotton Plant Standard Grade Guano	9	2	1
Swift's Dayvault Special H. G. Phosphate and Potash	12	..	6
Swift's Atlanta H. G. Phosphate and Potash	12	..	4
Swift's Farmers' Home H. G. Phosphate and Potash.	10	..	4
Swift's Plantation Standard Grade Phosphate and Potash	8	..	4
Swift's Wheat Grower Standard Grade Acid Phosphate and Potash	10	..	2
Swift's Field and Farm Standard Grade Acid Phosphate and Potash	10	..	2
Swift's Cultivator H. G. Acid Phosphate	14	..	..
Swift's Chattahoochee Standard Grade Acid Phosphate	12	..	..

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Swift's Harrow H. G. Acid Phosphate	13	..	..
Swift's Muriate of Potash	..	..	50
Swift's Nitrate of Soda	..	16	..
Swift's German Kainit	..	..	12
Swift's Special High Grade Acid Phosphate	16	..	..
Swift's Special High Grade Acid Phosphate and Potash	12	..	6
Swift's Farmers' Favorite High Grade Guano	9	2	3
Swift's High Grade Acid Phosphate	15	..	..
Swift & Co., Chicago—			
Swift's Raw Bone Meal (Total)	23	4	..
Swift's Bone Meal (Total)	25	3	..
Swift's Ground Dried Blood	..	16	..
Swift's No. 1 Ground Tankage	6	10	..
Spartanburg Fertilizer Co., Spartanburg, S. C.—			
Tiger Brand Acidulated Phosphate	14	..	..
Tiger Brand	8	2	6
Satulah	8	2	2
Glencoe	8	2	1
Buenos	8	4	4
West's Potash Acid	12	..	3
Brown's Compound	10	..	2
Potato Guano	7	3	7
Tomlinson, Bynum & Co., Wilson, N. C.—			
Dixie Cotton Grower	8	2	1
Tar River Oil Co., Tarboro, N. C.—			
Cotton-seed Meal	..	8	..
Virginia-Carolina Chemical Co., Richmond, Va.—			
V.-C. C. Co. 14 Per Cent Acid Phosphate	14	..	..
V.-C. C. Co. 16 Per Cent Acid Phosphate	16	..	..
White Stem	9	2.75	2
Plant Food	8	2	2
Good Luck	8	3	2.50
Diamond Dust	8	2	2
Admiral	8	3	2.50
Genuine German Kainit	..	..	12
Farmers' Favorite Fertilizer	8	2	2
Atlas Guano	8	3	2.50
North State Guano	8	2	1
Prolific Cotton Grower	9	2.75	2
Split Silk	8	3	2.50
Winston's Special for Cotton	8	2	2
Ajax	8	2	2
Blue Star	8	2.50	3
V.-C. C. Co. Special Potash	10	..	4
Delta	8	2.75	2.50
Farmers' Friend Favorite Fertilizer Special	8.50	2	2
Special High Grade Tobacco Fertilizer	8	3	3
Wilson Standard (C. S. M.)	8	2	2
Muriate of Potash	..	..	48
Sulphate of Potash	..	..	48
Nitrate of Soda	..	19	..
Cotton-seed Meal	..	7.50	..

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Orange Grower	8	2.75	2.50
Royal Crown	8	2.75	2
Superlative Guano	8	2.50	3
Battle's Crop Grower	12	..	3
Virginia-Carolina Chemical Co.'s High Grade Fertilizer	8	3	10
V.-C. C. Co.'s Lion High Grade Tobacco Fertilizer	8	3	4
Atlantic and Virginia Fertilizer Co., Branch V.-C. C. Co., Richmond, Va.—			
Carolina Truckers	7	7	7
Virginia Truckers	8	5	5
Eureka Ammoniated Bone	8	2	2
Eureka Ammoniated Bone Special for Tobacco	9	2.50	2
Bone and Potash Compound	10	..	2
Orient Complete Manure	8	2	1
Our Acid Phosphate	12	..	..
Crenshaw's Acid Phosphate	13	..	..
Valley of Virginia Phosphate	14	..	..
Eureka Acid Phosphate	10	..	..
Orient Special for Tobacco	8	2	2
Old Dominion Guano Co., Branch V.-C. C. Co., Norfolk, Va.—			
Old Dominion Special Wheat Guano	8	2	2
High Grade Alkaline Bone	10	..	2
Standard Raw Bone Soluble Guano	8	2	1
Old Dominion High Grade Bone Phosphate	13	..	..
Norfolk Soluble Bone	10	..	..
Old Dominion Potato Manure	7	5	8
Old Dominion 7-7-7 Truck Guano	7	7	7
Old Dominion 6-7-5 Truck Guano	6	7	5
Osceola Tobacco Guano	8	2.50	3
Planter's Bone and Potash Mixture	10	..	3
Old Dominion Sweet Potato Guano	6	2	6
Miller's Special Wheat Mixture	8	..	4
Old Dominion Soluble Guano	8	2	2
Farmers' Friend Fertilizer	8	2	2
Farmers' Friend High Grade Fertilizer	8	3	3
Royster's High Grade Acid Phosphate	12	..	..
Old Dominion Dissolved Bone and Potash	8.50	..	2
Old Dominion Soluble Tobacco Guano	8	2	2
Farmers' Friend Special Tobacco Fertilizer	8	3	3
Isley's Formula of Dissolved Bone Potash and Chem.	8	3	3
Bullock's Cotton Grower	8	2	2
Charlotte Branch V.-C. C. Co., Charlotte, N. C.—			
Ten-Two Bone Potash	10	..	2
Charlotte 15 Per Cent Acid Phosphate	15	..	..
Charlotte Ammoniated Fertilizer (C. S. M.)	8	2.50	1.50
Groom's Special Tobacco Fertilizer	8	3	4
King Cotton Grower	8	2	2
McCrary's Diamond Bone and Potash	8	..	3
Charlotte High Grade Special Tobacco Fertilizer (C. S. M.)	9	2.50	2
Catawba Guano (B. G.)	8	2	1
Special 3 Per Cent Guano (C. S. M.)	8	3	2

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Charlotte Ammoniated Guano (Blood Goods)	8	2.50	1.50
Queen of the Harvest (C. S. M)	8	2	1
The Leader (B. G.)	8	2	2
Charlotte Dissolved Bone	12	..	..
Charlotte Acid Phosphate	13	..	..
Catawba Acid	10	..	..
Davie & Whittle Branch V.-C. C. Co., Petersburg, Va.—			
Owl Brand Guano	8	2	2
Vinco Guano	8	2	1
Owl Brand Special Tobacco Guano	9	2.50	2
Owl Brand Guano for Tobacco	8	3	3
Owl Brand Acid Phosphate	10	..	..
Owl Brand High Grade Phosphate	13	..	..
Owl Brand Dissolved Bone	12	..	..
Owl Brand Acid Phosphate and Potash	10	..	2
Owl Brand High Grade Dissolved Bone	14	..	..
Owl Brand Truck Guano	8	6	5
Powers, Gibbs & Co., Branch V.-C. C. Co., Wilmington, N. C.—			
Fulp's High Grade Acid Phosphate	13	..	..
Cotton Brand Ammoniated Dissolved Bone	8	2	1
Cotton-seed Meal Soluble Ammoniated Guano	8	2	2
Almont Soluble Ammoniated Guano	8	2	2
Acid Phosphate and Potash	10	..	1
Dissolved Bone and Potash	10	..	2
Cotton-seed Meal Standard Guano	9	3	2
Almont Acid Phosphate	10	..	..
Almont Wheat Mixture	10	..	3
Cotton Brand Acid Phosphate	12	..	..
Almont High Grade Acid Phosphate	13	..	..
Cotton Brand High Grade Acid Phosphate	13	..	..
Eagle Island Ammoniated Guano	8	2	2
Gibbs' High Grade Ammoniated Guano	8	2.50	1
Powers' High Grade Ammoniated Guano	8	2.50	2
Carolina Golden Belt Ammoniated Guano for Tobacco	8	2.50	3
Cotton Belt Ammoniated Guano	8	3	2
Truck Farmers' Special Ammoniated Guano	8	4	5
Old Kentucky High Grade Tobacco Manure	8	3	3
Allison & Addison Branch V.-C. C. Co., Richmond, Va.—			
Standard Acid Phosphate	12	..	..
Star Brand Special Tobacco Manure	9	2.75	2
Old Hickory Guano	8	2	2
Rockett Acid Phosphate	10	..	..
Star Brand Vegetable Guano	8	4.50	4
Star Brand Guano	8	2	1
Anchor Brand Tobacco Fertilizer	8.50	2.75	2
Anchor Brand Fertilizer	8	2	2
B. P. Potash Mixture	10	..	2
McGavock's Special Potash Mixture	8	..	2.25
I. X. L. Acid Phosphate	13	..	..
Fulton Acid Phosphate	14	..	..
Allison & Addison A. & A	8	3	3

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Durham Fertilizer Co., Branch V.-C. C. Co., Durham, N. C.—			
Genuine Bone and Peruvian Guano for Tobacco	8	2	2
Carr's Special Wheat Grower	8	..	4
Durham Ammoniated Fertilizer	8	2	1
Excelsior Dissolved Bone Phosphate	14	..	..
Best Potato Manure	7	7	7
Gold Medal Brand	8	3	3
Standard Wheat Grower	10	..	2
Standard Guano	9	2	2
Blue Ridge Wheat Grower	10	..	2
Standard High Grade Acid Phosphate	13	..	..
Blacksburg Dissolved Bone	13	..	..
L. and M. Special	9	3	2
Blacksburg Soluble Guano	8	2	2
North Carolina Farmers' Alliance Official Guano	8	2.50	3
North Carolina Farmers' Alliance Official Acid Phosphate	13	..	..
Double Bone Phosphate	13	..	..
Durham High Grade Acid Phosphate	13	..	..
Durham Acid Phosphate	10	..	..
Diamond Wheat Manure	10	..	3
Great Wheat and Corn Grower	10	..	1.50
Durham Bone and Potash Mixture	10	..	2
Special Plant and Truck Fertilizer	8	5	3
Progressive Farmer Guano	8	2	1
Golden Leaf Bright Tobacco Guano	8	3	3
Raw Bone Superphosphate	8	2.50	1.50
Raw Bone Superphosphate for Tobacco	8	2.50	2
Genuine Bone and Peruvian Guano	8	2	2
James G. Tinsley, Branch V.-C. C. Co., Richmond, Va.—			
Tinsley's Strawberry Grower	6	4	4
J. G. Tinsley & Co.'s Tobacco Fertilizer	8	4	2.50
Tinsley's Stonewall Guano	8	2	2
Tinsley's Lee Brand Guano	8	2	2
Tinsley's Richmond Brand Guano	8	2	1
Tinsley's Irish Potato Guano	6	6	6
Tinsley's Stonewall Tobacco Fertilizer	8	2	2
Powhatan High Grade Phosphate	14	..	..
Killikinnick Tobacco Mixture	8	2.50	3
Tinsley's Stonewall Brand Acid Phosphate	10	..	..
Tinsley's Dissolved S. C. Bone	13	..	..
Tinsley's Bone and Potash Mixture	10	..	2
Tinsley's 10 Per Cent Truck Guano	5	10	2.50
S. W. Travers & Co., Branch V.-C. C. Co., Richmond, Va.—			
National Fertilizer	8	2	2
Beef Blood and Bone Fertilizer	8	2	1
Travers' Special Wheat Compound	8	..	4
Capital Tobacco Fertilizer	8	4	3
Capital Bone and Potash Compound	10	..	2
Capital Dissolved S. C. Bone	12	..	..
Capital Cotton Fertilizer	8	2.50	1
Champion Acid Phosphate	10	..	..
Standard Dissolved S. C. Bone	13	..	..
Travers' Dissolved Bone Phosphate	14	..	..
National Special Tobacco Fertilizer	8	2	2

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Southern Chemical Co., Branch V.-C. C. Co., Winston-Salem, N. C.—			
Tar Heel Acid Phosphate	12	..	..
Horse Shoe Brand Acid Phosphate	10	..	..
Victor High Grade Acid Phosphate	13	..	..
Red Cross 14 Per Cent Acid Phosphate	14	..	..
Comet 16 Per Cent Acid Phosphate	16	..	..
Quickstep Soluble Bone and Potash	10	..	1
Mammoth Corn Grower	10	..	2
Mammoth Wheat and Grass Grower	10	..	2
Farmers' Pride Bone and Potash	10	..	3
Winston Bone and Potash Compound	10	..	2
Winner Grain Mixture	10	..	4
Reaper Grain Application	12	..	3
Yadkin Complete Fertilizer	8	2	1
Pilot Ammoniated Guano Special for Tobacco	8	2.50	3
Electric Tobacco Guano	8	2	2
Electric Standard Guano	8	2	2
George Washington's Plant Bed Fert. for Tobacco	8	3	2.50
Click's 16 Per Cent Acid Phosphate	16	..	..
Elkin Acid Phosphate	12	..	..
Chatham Acid Phosphate	13	..	..
Sun Brand Guano	9	2.50	5
Norfolk and Carolina Chemical Co., Branch V.-C. C. Co., Norfolk, Va.—			
Genuine Slaughter House Bone	8	2	2
Genuine Slaughter House Bone Special for Tobacco,	8	2.50	2
Crescent Brand Ammoniated Fertilizer	8	2	1
Bright Leaf Tobacco Grower	8	3	3
Norfolk Truck and Tomato Grower	8	5	5
Norfolk Bone and Potash	10	..	2
Norfolk Best Acid Phosphate	13	..	..
Norfolk Reliable Acid Phosphate	10	..	..
Cooper's Special Bright Tobacco Fertilizer	8	2.50	3
Amazon High Grade Manure	8	3	3
Pretlow's Champion for Peanuts, Cotton and Corn	8	2	1
Virginia State Fertilizer Co., Lynchburg, Va.—			
Bull Run Acid Phosphate	16	..	..
Gilt Edge Dissolved Bone and Potash	8.50	..	2
H. G. Dissolved Bone and Potash	10	..	2
Gilt Edge Brand Acid Phosphate	14	..	2
Clipper Brand Acid Phosphate	13	..	..
Alps Brand Acid Phosphate	12	..	..
Lurich Acid Phosphate	10	..	..
Gilt Edge Brand Pure Bone Meal (Total)	20	4	..
Dunnington's Special Formula for Tobacco	8	3	3
Bull Dog Soluble Guano	8	3	3
Austrian Tobacco Grower	8	2.50	2
G. E. Special Tobacco Guano	8	2.50	2
Virginia State High Grade Tobacco Guano	8	2	2
Game Cock Special Guano	8.50	2	2
Battle Ax Tobacco Guano	8	2	2
Highland King	8	2	1
Mountain Top Bone and Potash	10	..	5
XX Potash Mixture	10	..	4
Genuine German Kainit	..	..	12
Dunnington's Special Formula for Tobacco	8	3	3
Number One Soluble Guano	9	2	..

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
S. C. Vann, Franklinton, N. C.—			
Pilot Guano Special Compound	10	2.50	3
Pilot Guano Special 4 Per Cent	10	2.50	4
Verner Oil Co., Lattimore, N. C.—			
Cotton-seed Meal	..	8	..
Williams & Clark Fertilizer Co., New York Branch Works, Charleston, S. C.—			
American Ammoniated Bone Superphosphate	8	2.25	1
T. W. Wood & Sons, Richmond, Va.—			
Standard Vegetable Fertilizer	8	3	3
Standard Potato Fertilizer	8	3	5
Standard Grain and Grass Fertilizer	8	2	2
Wood's Lawn Enricher	5	3	3
Wood's Pure Animal Bone (Total)	23	3	..
H. Weil & Bros., Goldsboro, N. C.—			
Nitrate of Soda	..	19	..
Genuine German Kainit	..	..	12
S. H. Ward & Sons, Jamestown, N. C.—			
Pure Bone Meal (Total)	20	4	..
W. H. Worth & Co., Raleigh, N. C.—			
Union Acid Phosphate	14	..	..
Guilford Acid Phosphate	13	..	..
Salic Acid Phosphate	12	..	..
Nylic Acid Phosphate	10	..	..
Ocala Ammoniated Guano	8	2	2
Apex Ammoniated Guano	8	2	1
Worth's XXX Guano	8	3	3
Standard Ammoniated Guano	8	2.50	3
Bone and Potash	10	..	2
Bone and Potash	10	..	3
Bone and Potash	10	..	5
E. F. Young, Dunn, N. C.—			
Young's Special Compound for All Crops	8	2	2

FERTILIZERS.

The cost of fertilizers used by the farmers of North Carolina during this season is enormous. The amount will exceed that of any previous year. It is a good time to repeat what has been substantially said before about the careless and ignorant use of fertilizers. That much fertilizer is used without reference to its contents—that is, without reference to what fertilizing ingredients it contains—there can be no doubt. Nor is due consideration given to the condition of the soil or to the fertilizing ingredients the soil needs and the crop to be planted. Many a farmer buys a sack of fertilizer because it is branded a sack of fertilizer, and uses it on any soil and any crop. It may do, and generally does, some good, but not to the full value it has cost him. If the fertilizer contains an excess of potash over and above the needs of the soil or crop, a part of the cost of the fertilizer is wasted. If the farmer uses a fertilizer containing a greater amount of ammonia than the crop needs, part of his money is wasted; if he uses acid phosphate alone on land that needs ammonia and potash also, his crop will not produce as well as if the two lacking ingredients were fully supplied, and hence a part of the acid phosphate is lost.

It is necessary to learn from observation and experience, together with such aid as THE BULLETIN can give, what combination of chemical ingredients is best on different soils and for different crops, and then to buy fertilizers accordingly.

The brand name has nothing to do with it. It is the stuff inside the sack and not the brand printed on the outside that determines the value.

Many intelligent farmers are studying every year to learn the needs of their crops and soil, and use fertilizers adapted to their needs, and they are the farmers who make money by the use of fertilizers, and the only ones in the long run who do.

IMPROVEMENT OF CORN BY SEED SELECTION.

By C. B. Williams.

Over 47 per cent of the cultivated land in North Carolina is devoted to corn. The average yield for the State is less than thirteen bushels of shelled corn per acre. Three years ago experiments were inaugurated by the Department of Agriculture looking toward the increase of this very low yield per acre by means of careful seed selection. The method that is being followed is to conduct on the large soil-type areas of the State comparative tests of the leading varieties grown in this and other States through a sufficient number of years to secure average weather conditions. From the variety or varieties demonstrated by this test to be the most prolific seed selection for further improvement is begun. The testing of varities of all agricultural crops is of the most fundamental importance, as is evidenced by the difference in yield of different varieties grown side by side in the same field on the same type of soil with identical cultivation and fertilization, this difference being due to the inherent qualities of the seeds of the individual varieties which are transmitted from parent to progeny.

The work last year at the Edgecombe Test Farm brought out a very striking example of the difference in yield of two varieties of corn under identical soil, fertilization and cultivation conditions. *Cocke's Prolific* (from selected seed) yielded 35.2 bushels of shelled corn per acre, while another variety only produced 20.5 bushels—a difference in yield of 14.7 bushels, which at fifty cents per bushel gave a clear gain of $7.35 in favor of the first variety.

It must be kept in mind that the underlying principles of plant and animal improvement are almost identical, and that similar methods to those which have been adopted in the improvement of the various breeds of live stock must be followed by all those who wish to grow plants of increasing productiveness. It must also be remembered that as intelligent feeding and good care stand to animal breeding, so do proper fertilization and thorough cultivation of the soil stand to plant breeding or improvement; for if proper food and care are not furnished both plants and animals, improved breeding will not only be impossible, but retrogression inevitable. With the same thought and care, results are secured much quicker with plants than with animals, as a completed growth is obtained in one year with most plants, while with animals it requires several years to secure complete knowledge of what one has obtained by a certain cross.

METHODS OF IMPROVEMENT.

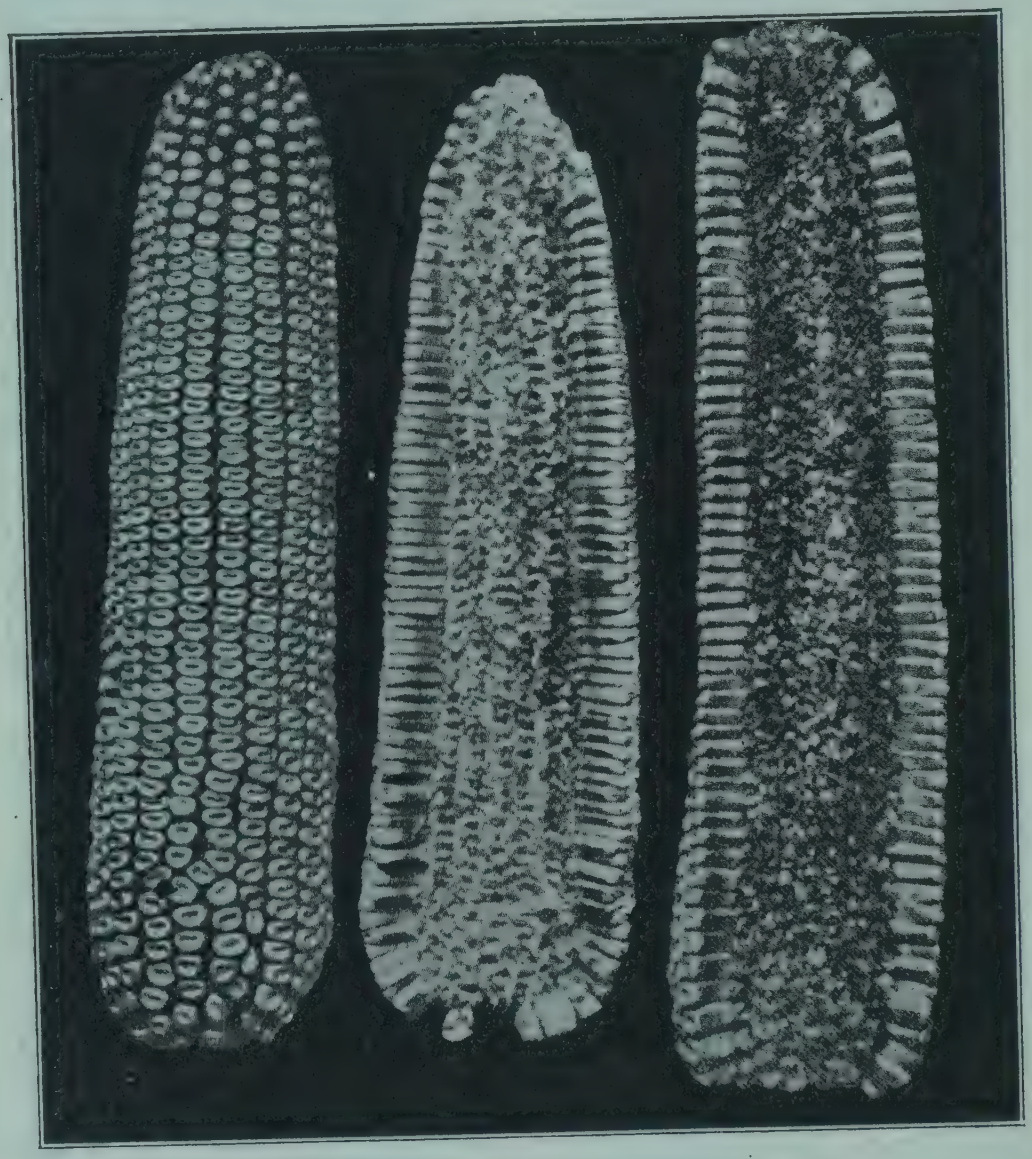
At present there are three methods in common practice for the improvement of corn by seed selection, viz.: (1) importation of improved seed; (2) field selection of the best home-grown seed; and (3) home field selection and growing of seed corn in an isolated field.

a b c

FIG. 1.

IMPORTATION OF SEED.

Under no circumstances should farmers depend each year upon importation for seed corn, as corn brought from a distance (where soil and climatic conditions are different) seldom yields satisfactory results until it has become thoroughly acclimated, which usually requires from two to three years. The force of this statement is amply illustrated in our experience at the Edgecombe Farm last year with *Leaming* corn, which was brought from Illinois for



a b c

FIG. 2.

(From Iowa Agl. Expt. Station).

our comparative variety test. At the Illinois Experiment Station *Leaming* had proven to be one of the best varieties raised in that State, but when brought to North Carolina it gave the smallest yield of the thirteen varieties tested. It is likely then that this variety, when thoroughly acclimated, will

increase materially in yield. This further emphasizes the need in all variety tests of as complete history as possible of the conditions under which the parent plants were grown; especially should the locations be known from whence all seed come, before one can properly interpret varietal results, for if not acclimated, suppressed yield may be expected.

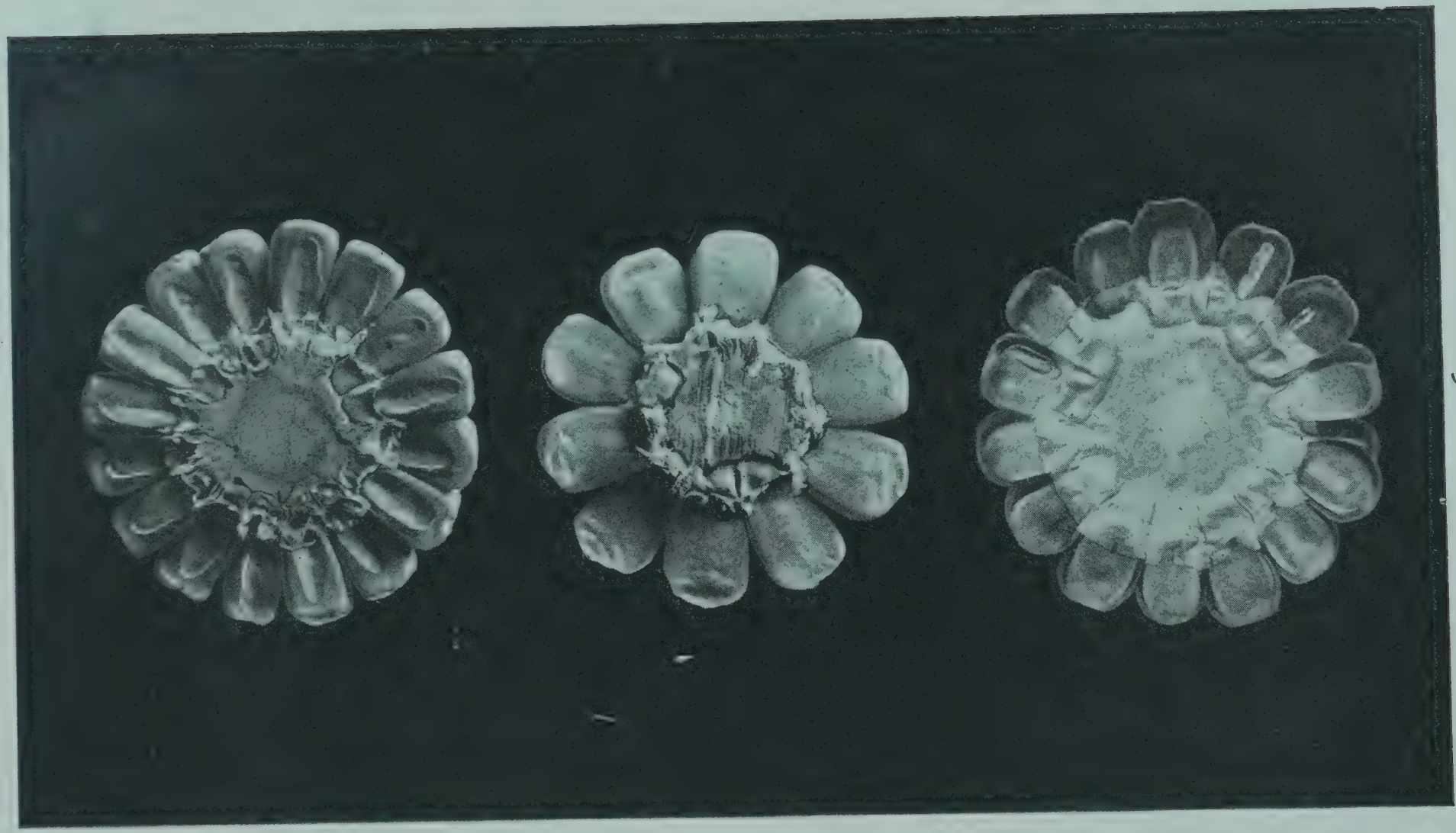
The advantage in imported seed is that the farmer is enabled to begin improvement where some careful grower or skilled plant breeder has left off. It is here as with animals: if it is desired to breed milk cows, it is not best to go back to the "scrub" to begin to breed, selecting the desirable animals, but rather to begin with some of the best of the recognized milk breeds, like the Jerseys, Guernseys, etc., and with these continue improvement by breeding and selection.

In buying imported seed, care should be exercised that it comes from some careful grower or breeder, preferably a member of some seed-corn breeders association, for it is well known that many seedsmen buy the whole surplus of corn crops in the West, and, without a particle of selection, shell and screen this corn and place it on the market as seed of a high grade, advertising it in extravagant superlatives and charging for it many times the market price of ordinary corn. To avoid this deception, have the seed shipped to you on the cob, so that you can see exactly what you are getting and know what to expect from the seed when planted. When the ears come, if they are not satisfactory they can be returned to the shipper, or if only a few ears are unsatisfactory they can easily be thrown out before shelling. It is best in shelling seed corn that each ear should be shelled separately before putting with others, so that ears with undesirable characteristics may most easily be discarded.

SIMPLE FIELD SELECTION OF SEED.

By going into the field just before harvest time and making careful selections of seed corn from the best stalks bearing the best ears and hence best adapted to local conditions, it will be possible for the farmer to greatly increase his yields of corn at very little expense. The selection should not be turned over to the hired man, but should be given the best efforts of the farmer himself, as it is known that time thus expended will give better returns than any other work done on the farm. It must constantly be kept in mind that on every farm changes beneficial or detrimental are continually taking place, as it is an inherent tendency of all plants to vary more or less and retrograde or "revert" to a less productive state if selection of some kind is not continually kept up By continually selecting and planting corn possessing certain desirable characteristics, it will gradually increase in yield and have these desirable qualities more permanently fixed from year to year.

In making the seed selection in the field, at least four times as much corn should be gathered as is desired for seed the following year, so that further and more careful selection can be made after the corn has been taken to the barn. In the final selection, the ears should be arranged conveniently on the barn floor or ground, and with an ear of the type desired in mind or hand, go over the lot and remove all undesirable ears. The seed thus selected should be transferred to a box or barrel and covered with wire gauze to keep out rats and mice, and placed in some dry place and allowed to remain until the following spring.



a b c

FIG. 3.

It is a common and almost universal practice in North Carolina to make seed corn selection, where it is made at all, from the crib in the spring just before planting time. This method yields better results than no selection at all, but is far inferior to the field selection method outlined above, which has taken into consideration the performance record of the parent plant.

FIELD SELECTION AND GROWTH OF SEED CORN IN AN ISOLATED FIELD.

By carefully selecting a limited number of the very best obtainable seed ears from the field in the fall and planting them in a field separated from any other corn, something like five or six hundred yards, to prevent crossing by pollen carried by the wind, much better and quicker results are secured than where simple selection alone is practiced, *i. e.*, if the breeding plat or field is properly cared for. This field should be tolerably fertile (equal at least to the lands on which the general crop is to be grown), for poverty of soil is very conducive to reversion, thereby losing in one year's growth on a poor soil what has been gained by a number of years of rigid selection. The rows in the breeding plat should be of such length that they will require only about three-quarters of an ear per row, and in planting, each row should receive its individual ear, so that the performance record of each seed ear can be seen, and if not satisfactory the whole row can be rejected. After planting as many rows as is desired from the selected ears, a composite sample should then be made of the quantity of each ear left over, and a border of several rows planted entirely around the breeding plat to still further prevent the possibility of wind pollination from outside cornfields. The land on which this plat is to be located should be given deep and thorough preparation. The subsequent cultivations of the corn should be every ten to twelve days, with a cultivator with small hoes on, rather deep early in the season, but becoming shallower and with the larger hoes on as the season advances and the root system extends towards the middle of the row and nearer the surface. Especially is this important on upland soil, where conservation of all moisture plays such an important part in yield. When the corn in the breeding plat has attained to the tasseling stage, the tassels from all barren stalks should be carefully removed just as they are emerging from the roll of the last leaf. The tassel is the male part of the corn plant, while the silk is the female part. When a stalk is barren or bears only male organs, the tassel is generally above the average in size, strength and vigor, as all the vital forces of such a plant have been expended on this single organ of reproduction; hence, when an ovule or embryonic kernel, through the silk, is fertilized or pollinated by the yellow dust-like pollen from a barren stalk, it will, when planted, have a strong tendency, inherited through its male parent, to produce a barren stalk. The tassels should also be removed from all weak and stunted plants; for the same reason we would not use a "scrubby" stunted bull in a herd of cows if we cared anything for the future improvement of the stock. It has been demonstrated time and again by carefully conducted experiments that by selection from poor plants the yield of corn will not only be materially reduced, but will be of inferior quality. The writer has, during the past summer, visited quite a number of cornfields in different parts of

the State and has yet to find one that contained less than 10 per cent of barren stalks, which means that from every ten acres in cultivation a loss of one acre's yield from nonproductive stalks is sustained. In one field in which a count was made it was found that from 40 to 50 per cent of the stalks were barren, although this corn possessed a luxurious growth and had attained an average height of something like 10 to 12 feet. It must not be overlooked that the secret in successful corn raising consists in having each stalk bear at least one good-sized ear, as it costs just as much to cultivate nonproductive stalks as prolific ones. The number of barren stalks in our fields should not, under average conditions of weather and cultivation, ever reach over 3 to 5 per cent.

FIG. 4.

CHARACTERISTICS TO BE TAKEN INTO CONSIDERATION IN SEED SELECTION.

As total yield of shelled corn per acre is the principal consideration in the production of corn, the following characteristics correlated with large yield will be taken up somewhat in detail for consideration.

NUMBER OF EARS PER STALK.

The stalk that bears two medium-sized ears will yield more corn per stalk, and hence more per acre, than the one that grows only one large ear. This is an important factor that is of necessity entirely left out of consideration when barn selection in the spring is resorted to, as it will be perfectly natural

to select there the largest specimens for seed, which will almost invariably have been grown upon stalks that bore but one ear; hence we have unconsciously, by the methods in common practice in North Carolina for seed selection, established generally one-eared varieties. In experiments conducted at the Edgecombe farm last year with seed from one-eared, two-eared (bottom and top) and four-eared stalks, the larger yields generally resulted from the selections from the stalks that bore the highest number of ears. To illustrate further, take for comparison two varieties of corn that were in our variety test of corn at this same farm last year. *Cocke's Prolific* is a two or more eared variety, while *Holt's Strawberry* is mainly a one-eared variety with a large stalk. The difference in shelled-corn yield of these two varieties under identical cultivation and fertilization on the same soil was 10.3 bushels in favor of *Cocke's Prolific*. The difference in yield between *Holt's Strawberry* and *Weekley's Improved*, another two or more eared variety, was 8.6 bushels in favor of *Weekley's Improved*.

STALKS.

The kind of stalk from which to make selections is one possessing a tolerably large circumference at the base and gradually tapering towards the top, as this is the type that stands drought best and is not as apt to be blown down as a high, slender one. In selection, weight should be attached to good root and leaf development of the mother parent, as all nourishment and growth are entirely dependent upon the thoroughness with which these two organs do their work. Poor root or leaf development is always indicative of meager growth and small, poorly developed production. All selections should be made from perfectly healthy plants.

EARS.

In selecting seed corn, care should be given to the following characteristics of the ear: Position on stalk, kind of shank, shape and color of grain and cob, size of cob, filling out of butts and tips, number of and distance between rows of kernels, and length and circumference.

Position on Stalk.—The position of ear on stalk should be tolerably low down, for two reasons: (1) because the stalk will be less liable to be blown down, as the ear will have less leverage, thereby averting the injury caused by lying on the ground; and (2) because if at a convenient height it can be gathered with a great deal more ease and at considerably less expense.

Shank.—This should be of sufficient size and strength to hold the ear well and in a rather drooping position, so that rain will be shed and hence prevented from running into the ear and causing the grain to rot, as would often be the case if the ear were held in an upright position.

Shape.—The cylindrical ear (Fig. 1—c) is the best type, as it is the one that yields the highest percentage and the largest total amount of shelled corn. The rows of kernels should run parallel the full length of the cob without change in shape or diminution in size, or but very slight. If the ears are tapering (Fig. 2—b) there is a suppression of yield, due to one or both of two causes, viz.: (1) diminished size of kernels at the tips, and (2) dropping of rows of kernels.

In planting, the small kernels at the butts and tips of ears should be discarded. They are less likely to germinate, and when they sprout the vitality of the young corn plants from them is less than those from better developed

seed, as the amount of plant food in the latter is insufficient to develop plants of sufficient size and vigor to secure with facility food for themselves from the soil before that stored up in the kernels has become exhausted.

Color.—Yellow corn should have a deep-red cob, while white corn should possess a white one, and any variation from these types is indicative of crossing of varieties. The market price of meal or grits made from white corn with red cobs is lower because of particles of the red cobs getting into the corn and being ground in with meal, giving it a reddish cast.

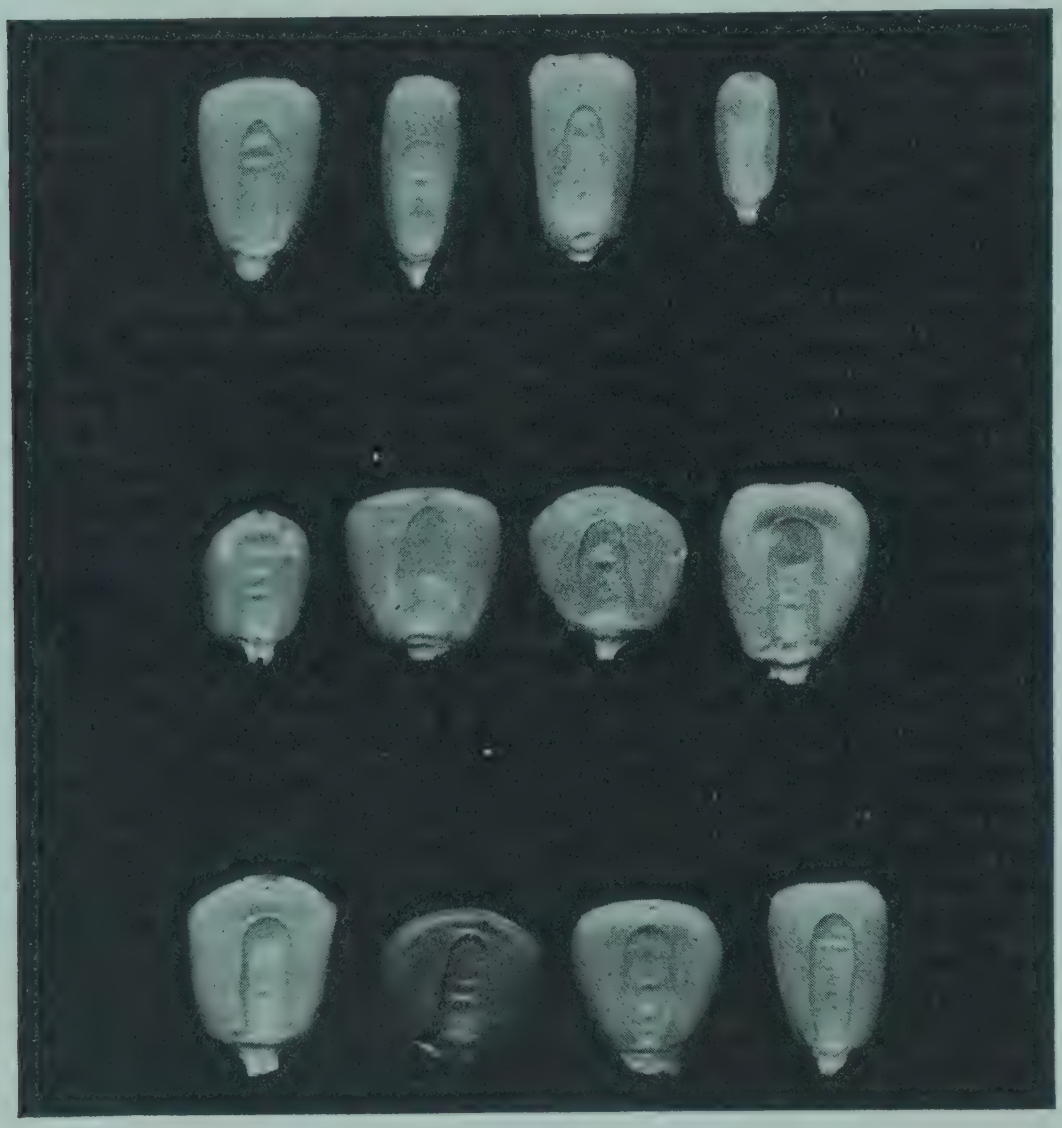


FIG. 5.

Size of Cob.—A medium-sized cob is the best, because it yields the largest proportion of corn to cob. If the cob is small, of necessity the number of grain rows is restricted, and when large the proportion of corn to cob is reduced. The best size cob is shown in Fig. 3—a, Fig. 3—c is too large, while Figs. 3—b and 1—b are too small.

Length and Circumference.—The length to circumference should be about as 4 to 3, *i. e.*, if the ear is 8 inches long its circumference should approximate 6 inches, measured about one-third the way from the butt to the tip, to pro-

duce the largest yield. Too large circumference usually indicates small kernels of low vitality and poor feeding value.

Filling-out of Butts and Tips.—The more perfectly ears are filled at butts and tips, the larger the percentage yield of corn. It is possible, by rigid selection of ears filled compactly at butts and tips, to increase materially within a few years the annual yield over corn in which no consideration is given to these characteristics. In Fig. 4 are shown poorly and well-tipped ears.

Number and Distance between Rows and Kernels.—The number of rows to the ear should be large and the distance between rows small to secure the

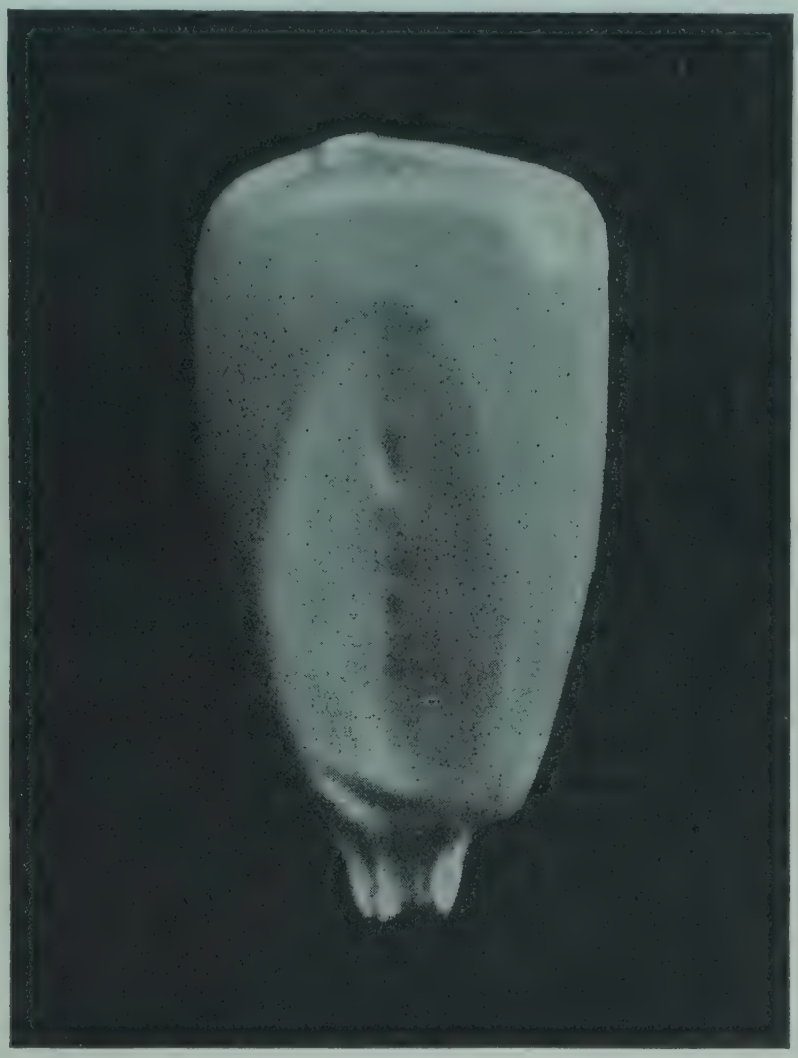


FIG. 6.

largest yields. A wide *sulcus*, or distance between rows, indicates a reversion to an inferior type that will not justify the farmer of to-day in growing. In Fig. 1 is strikingly shown the difference in the solid setting of corn on (c) and (a). In (c) there is little or no space between the rows, while in (a) there is considerable.

KERNELS.

The corn kernels may be divided into four parts: (a) the hull or outer layer; (b) the hard, flinty portion next to the hull and lying principally on the sides; (c) the white, floury portion occupying the crown; and (d) the

germ, which is situated on the side of the kernel, facing the tip of the ear. The hard, horny portion contains the larger proportion of the protein (flesh-forming food), while the white, floury part at the crown is rich in carbohydrates (which is the fattening and heat-producing portion of the grain, mainly starch), and the germ carries a greater part of the oil and is also rich in protein. In making seed selections for high percentage yields, the kernels should be of a medium wedge shape, but not too long and sharp, for such a form not only "wastes space at the cob and restricts the size of the germ," but indicates inferior quality and low vitality. The wedge-shaped kernel is the one that fills more compactly than any other the space between the grain rows.

In Fig. 5 are shown good and bad forms of kernels. Kernels 1 and 12 are the best forms, while all the others are poor. Also in Fig. 6 is a proper-shaped kernel, photographed four times natural size. Its arrangement is shown on cob, Fig. 3—a.

It is always wise to test the germinating power of seed corn, especially if it is imported. It can be done as follows: Take two ordinary plates, fill one with sand saturated with water, and place 100 representative kernels, points downward, in the moistened sand, and then place the second plate over the first and set aside in some warm place. Keep the sand moist, and in from five to seven days 95 per cent of the kernels should have sprouted. If much less than this per cent germinate, the seed cannot be relied upon as safe to use.

SUMMARY.

1. In improving seed corn, obtain first the best yielding variety available and which is adapted to your soil and climatic conditions, and from this select seed for increasing the yield, having in mind the following characteristics:

2. Size and general form of stalk, the number of ears it bears and their attachment to and location on the stalk.

3. The shape of the ear (cylindrical form being preferable), its comparative length and circumference, the color of cob and grain, size of cob, filling of butts and tips, number of rows of corn on ear, and the distance between rows, size and form of kernel, are important and should be carefully observed.

REPORT OF FARMERS' INSTITUTES—SUMMER SEASON, 1903.

Compared with former years, the institutes held this year have been very satisfactory, both in point of increased attendance and interest manifested. The marked increase in attendance may be partially due to the more thorough and systematic advertising of the meetings, but undoubtedly much of it is the result of an increased interest in agricultural work. The smallest attendance at any institute this year was 118, while the largest numbered over 400. The average attendance has been 165 farmers at each meeting, which is easily double that of former years.

The Farmers' Institute has become thoroughly established in this country as an important factor in modern agricultural progress and education. It is the modern school of practical agriculture for those actually engaged in farming, and especially for those who never have and for various reasons, imaginary or otherwise, never can attend a modern agricultural college.

These institutes can never be entirely successful and productive of the most good until there is a thorough and active local organization, for institute purposes, of the farmers of each county. Without such local interest, it is impossible for the Department of Agriculture to get in sufficiently close touch with the different sections of the State to know their various needs and the subjects which most interest them.

The Farmers' Institute should be a permanent local organization, holding meetings at least four times a year for the discussion, by the farmers themselves, of the various problems involved in their business. The farmers of North Carolina have not yet fully recognized the true function or purposes of the Farmers' Institute as developed in some other sections. By us it is too frequently looked upon as a "formal affair," where certain specialists from the State Department of Agriculture and the Agricultural College may make addresses. This is in no sense as it should be. The Farmers' Institute should be an occasion where the farmers themselves may meet and compare ideas and methods and profit by the experiences of each other. Help in the way of speakers from the Department of Agriculture should be used at one meeting each year, but this should be only a feature instead of the entire institute, as is now the general custom. In short, the farmers should consider it *their* institute and should arrange for the meeting, select the subjects, and the speakers, and where some of the speakers are from among themselves much better results are always attained.

As a nucleus or start for permanent local organizations that will finally take charge of the arrangements for the institutes and push the work to the point of making it of popular interest, a successful effort has been made to organize a committee of active farmers in each county where institutes have been held this year. One active man was selected by those at the institute from each township in the county, and a chairman chosen from among their number. When the people of any of these counties again desire an institute (and they should have at least one each year), it will be much easier for the Department of Agriculture by conferring with this committee to select the men best fitted to discuss the questions of most interest to that particular

section and to distribute the printed matter necessary to properly advertise the meeting. Up to this time a local organization or institute committee has been obtained in the following counties: Anson, Caswell, Catawba, Davie, Edgecombe, Franklin, Gaston, Granville, Iredell, Lincoln, Mecklenburg, Person, Richmond, Rockingham, Union and Vance. Far more successful institutes should be held in all these counties next year, and may be if the local committees will but take an interest in arranging therefor. The needs of the institute work in this State at present seem to be chiefly as follows:

1. A local committee of arrangements in each county that will take an interest in and work up the meeting.

2. That more local farmers take part in the discussions, ask questions and make short talks on subjects of practical local interest in which they are experienced.

3. That the institutes be held more frequently and at regular intervals.

4. That the time and place of the meetings and speakers and subjects be better advertised in advance.

5. That the meetings begin earlier in the day (9 or 9:30 A. M.) and at the time advertised.

It is the aim of the Department of Agriculture to hold institutes or send speakers to all counties in the State, and especially to those making requests for the same. Any such requests which, for any reason, have not yet been granted will be as soon as conditions will permit. When practicable, it is necessary to arrange a succession of institutes in adjoining counties, in order to reduce expenses and enable as many institutes as possible to be held with the limited funds available for this work.

In the following pages appear several of the addresses delivered at the Farmers' Institutes held during 1903. These written papers are generally more formal than the actual institute talks, and much of the better portions of them—the questions and answers which made them applicable to the conditions of each farmer and section—are of necessity omitted.

STOCK RAISING.

By Tait Butler.

There is so little live stock raised in this State that, were it not for the fact that I deem it of the utmost importance to our agricultural development, I would hesitate to take up your time with even a brief discussion of the subject.

In approaching this question we may well ask ourselves, Is there need for more live stock on the farms of North Carolina? The more I see of the State—and I have now been in eighty-five of the ninety-seven counties—the more thoroughly I become convinced of the necessity for more humus or vegetable matter in the soil. In fact, the one great need of the soils of the State is vegetable matter, which will add fertility, retain moisture, prevent washing and leaching, and reduce our fertilizer bills. This vegetable matter can only be put into our soils economically by the growing of more forage crops and the feeding of these to better live stock. But we need live stock for other reasons. In every line of production success in these days is made possible only by utilizing the by-products and preventing the wastes.

Let us look at merely one of the many wastes of North Carolina farmers. We will spend this year about $7,000,000 for commercial fertilizers, of which at least $2,500,000 will be for nitrogen, that might have been gathered from the air by leguminous forage crops. In our case, to supply part of that nitrogen, we have probably used not far short of $2,000,000 worth of cotton-seed meal. In doing so we may have obtained $2,000,000 worth of fertilizer, but we have certainly buried in the ground and, therefore, wasted $2,000,000 worth of the best, because the cheapest, cattle food known to the civilized world to-day.

A pound of cotton-seed meal is worth a pound and three-quarters of corn for feeding cattle, but when cotton-seed meal is fed and the manure saved with reasonable care, three-fourths of its fertilizer value may be regained in the droppings. Can we continue to waste three-fourths of the value of our cotton-seed meal because we have not learned, and apparently do not want to learn, to raise and care for live stock? At present the price of cotton-seed meal is based on its fertilizer value alone, but as its food value becomes better appreciated the price will be determined by its combined fertilizer and feeding values. During the last ten years the price of meal has risen from $15 to $25 per ton, and I predict that during the next ten years it will advance to $35, because it is worth that amount in comparison with the usual price of other food stuffs. Can we afford to continue to use it as fertilizer alone at that price and ignore and waste its feeding value?

To look at this question from another point of view, we may pertinently ask, Can we grow the grass necessary to make live-stock husbandry successful? For it is a well-known fact that the cheapest way to keep an animal is on pasture. To this question I frankly answer, I don't know. Neither do you know. You have never really tried to grow grass. For fifty years or more you have been trying to kill grass. The only facts which I have to offer on

this point, therefore, are the statistics of the United States Department of Agriculture, showing the productiveness of our meadow lands when compared with those of the great stock-growing States of the Northwest.

These are as follows:

AVERAGE YIELD PER ACRE OF HAY—1891-1900.

State.	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	Avg.
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Iowa	1.20	1.25	1.58	.73	1.08	1.74	1.50	1.75	1.34	1.42	1.359
Illinois	1.25	1.25	1.21	1.14	.66	1.38	1.29	1.56	1.29	1.27	1.230
Missouri	1.15	1.15	1.24	.85	1.17	1.43	1.15	1.60	1.37	1.29	1.240
Kansas	1.30	1.10	1.31	.77	1.24	1.42	1.30	1.46	1.57	1.32	1.279
North Carolina	1.10	1.20	1.70	1.45	1.63	1.26	1.25	1.70	1.50	1.41	1.420

It will be noticed that not only has the average yield of hay (grass) per acre been higher in North Carolina for the last ten years than in Iowa, Illinois, Missouri or Kansas, but another significant fact also appears, namely, that the yield was more uniform in North Carolina than in any of these hay-growing States. The lowest yield per acre in North Carolina during any one of the ten years was in 1891, when it started at 1.10 tons per acre, but in 1894 Iowa, Missouri and Kansas only produced .73, .85 and .77 of a ton per acre, respectively, while in 1895 Illinois fell to .66 of a ton per acre.

These are important facts in their relation to stock raising, for the first essential of a grazing country is a uniform and abundant growth of grass, which is assured to this State by our long summers and abundant rainfall.

Do not understand me as intimating that our lands are as rich as those of Iowa, but owing to our longer growing season and greater rainfall, I believe we can produce as much rough forage per acre as can be done in any of the great stock-raising States of the Union.

If we have the cheapest grain food in cotton-seed meal and can produce rough forage with ease and in abundance, why has stock raising not been more successful in the State? This is indeed a pertinent question, the answer for which should be sought with care and in all soberness. I am of the opinion that there is not one but many reasons, some of which appear to me plain and of which I desire to speak briefly.

While any kind of farming, to be successful, requires intelligence, personal care and education, live-stock husbandry is the most exacting in these respects. Yet we have never made a study of this phase of farming. We have never taken the business seriously and looked upon it as entitled to first consideration in our farming operations. Until we have devoted study, time and money to the growing of forage crops and mastered the complex problems involved in the science and practice of feeding; until we have studied the laws and principles of breeding, become better judges of live stock and learned the breeds and types adapted to the different purposes for which live stock is produced, and until we come to look upon animal husbandry as an important part of our farming, out of which money is to be made, it is not at all likely we shall be successful growers of live stock.

We may as well admit we are not stockmen; we know nothing about the subject, because our system of farming has been an entirely different one. We know how to grow cotton or tobacco as well as any other people, and if we turned our attention to stock raising in real earnest we would do that success-

fully also, but as yet we have utterly failed to grasp the true live-stock idea. The purpose of live stock is not production, but merely to furnish a convenient market for all the foodstuffs that can be grown on the farm and at the same time return to us the fertilizer necessary for the growing of future crops. If we give the stock merely the food and care necessary to sustain life, we not only get no profit, but lose even that which we give. On the other hand, if we give good care and an abundance of food, we are most likely to get full market price for all given and some profit for our trouble. However, we must not expect a large profit on the foods given and another on the stock. At the high prices for which forage crops may be sold in this State at the present time, we should be well satisfied with the profits on their production and accept merely the manure for our trouble in caring for the stock.

Heretofore our men of means have frequently put their money into live stock without the slightest knowledge of even that which they were buying, much less knowing anything of the proper care and feeding of it. Furthermore, instead of living on their farms, where they might have learned something of the business by giving it their personal attention, they have turned it over to those who knew little more and cared less.

The live stock which to-day is supplying the largest markets of the world, Chicago and Kansas City, is raised by the small farmers of the country. In comparison the ranches or large farmers supply a very small part of it. That is just what we need in North Carolina—a few better animals on every farm. Let the men of means put their money into the business if they choose and lose it if they do not give the business their personal attention; but especially let us urge every farmer, no matter how small his operations, to get a few better animals, take better care of them and grow more food for them.

In conclusion, let me emphasize the necessity of learning the business before putting all our money or labor into it. I would not have any person infer that I think the profits will be generally large or that they will come easy. I would most earnestly advise against any man discontinuing the growing of cotton or tobacco and placing his whole dependence on live stock; nor do I think it would be wise to even materially reduce his production of these crops, with the cultivation of which he is familiar, until he has learned something of live-stock husbandry by actual experience. Fortunately, such is not necessary, for on every farm a great deal more food for stock might be produced, at a cost fully repaid by the improvement of the soil, without in the least lessening the production of what we regard as "money" crops.

Question: What breed of cattle do you think best for this State?

Answer: That depends very largely on the man and the purpose he has in view. If he be a "scrub" man who will give "scrub" care and food, then the native or "scrub" cow will give as good results as any. If milk and butter are desired, by all means select one of the special dairy breeds, of which there is none better than the Jersey.

On the other hand, while I am convinced that dairying properly conducted will prove the most profitable form of cattle husbandry, still, with our lack of knowledge of the stock business, I believe the growing of beef cattle likely to prove more uniformly successful and satisfactory, especially on our cheap lands. In other words, it seems to me we had better start with beef production and when we have learned something of the selection, breeding, care and feeding of cattle we may take up the additional problem of butter making.

When beef production is the chief consideration it is not so much a question of which breed as the correct type or form. In all the beef breeds first-class beef-producing animals are to be found; likewise inferior animals, unprofitable feeders, in short, scrubs, are also found in all of them. What is most important is to select the breed and individual animals that will give the largest percentage of high-class beef cattle in their progeny. In this respect there is not much difference in the best types of short-horns, Herefords and Angus, but all of these possess considerable advantage over the dual-purpose breeds in the uniformly high-class beef qualities of their progeny. A large number of people still believe in the dual-purpose idea, and we are frequently asked to name the best breed for both beef and milk. That the so-called dual-purpose breeds will in many instances produce an average quantity of milk of average quality, and be capable of making profitable beef, we do not think any well-informed man will deny; nor will he deny that individuals of those breeds may be capable of making average beef and also yield profitable returns in the dairy. Moreover, individuals of those breeds occasionally possess the highest qualities in either beef or dairy lines, but such excellence is not possessed by the same individual in both lines. In other words, while the dual-purpose does exist in breeds, it does not exist to a high degree in individuals. As they excel in one they lose in the other, so, as a breed, only average qualities are attained.

The question arises, why are the highest dairy and beef qualities incompatible in individuals? Because those qualities in their highest development are the result of an inheritance of entirely different types of conformation and habit.

The beef animal has been bred to retain the product of the food consumed in his body as flesh and fat, while the dairy animal is bred to throw it off from the body in the form of milk, only retaining enough for the bare needs of the animal economy. These functions are so essentially different, if not antagonistic, that necessarily the types are entirely distinct. The divergence in form becomes apparent at a glance at typical specimens of the two classes of animals. The beef type calls for a massive head and a short, thick neck, while the dairy form shows a delicate, clean-cut head and slender neck. The former presents shoulders and withers that are broad and flat, while the latter has thin shoulders and is sharp at the withers. The lower line of the beef type is straight with the flanks, very full and thick, while in the dairy cow the straight lower line is absent and the flank is especially thin and "cut up" to a marked degree. The same contrast is noticeable in the hips and loins. In the one is the thickly-fleshed loin and broad, smooth hips, while in the the other the same parts are lean and angular. The degree of difference in the opposing types is still further accentuated in the thighs. Those of the beef animal are thick from side to side, and so well fleshed that the posterior line is straight or only slightly curved from root of tail to hock. In the dairy cow the thighs are thin to give place for a large udder and the absence of any surplus flesh gives a decidedly concave posterior line.

But for beef production the beef-bred steer excels the dairy-bred steer, or the scrub, because of these very differences in conformation: First, the proportion of dressed carcass, or meat, to gross or live weight, is from five to ten per cent greater in the beef-bred steer than in the scrub, and the amount of

loose tallow and suet is much less; second, when the dressed carcass is cut up by the butcher there is in the carcass of the beef-bred steer a much larger percentage of valuable or high-priced meat than in the carcass of the scrub.

As a consequence the beef steer when placed upon the market brings from 25 to 40 per cent more money, and that alone is his chief claim for superiority.

However unfortunate it may be, it remains a fact that the habits of certain farmers and the conditions on many farms still supply a useful field for the dual-purpose breeds. Of these probably the Devon and Red Polled will be among the most useful.

IMPROVEMENT OF THE SOIL.

By W. F. Massey.

I propose to treat this subject under three general heads. First, the preparation of the soil mechanically; second, the rotation of crops, and third, the rational use of commercial fertilizers as a means for soil improvement. We plow land for the purpose of breaking up its particles, admitting the air and moisture, making it more retentive of moisture and enabling the roots of plants to penetrate the soil and find the food they need. The proper fining of the soil by thorough tillage before planting is a matter not so well understood as it should be. The complete fining and grinding of the particles of the soil before planting a crop releases plant food, and will often do as much good as the application of fertilizers without such thorough preparation. If we take a lump of rock and dip it in water we will find that its surface is coated over with a thin film of water, which soon dries off. In like manner a hard lump of soil may be moistened by a light shower and soon get dry again. Now, if the rock is pulverized to a powder every little particle of it will be covered with a film of water, and the amount of moisture held will be immensely increased. The same thing takes place when the hard clay lump is pulverized—it holds far more water. Tillage also releases plant food. Throw a lump of phosphate rock on the land and it will lie there for generations before giving up its plant food. But pulverize it as fine as flour and spread it on the land and you will soon see that plants are getting food from it. To a lesser degree the pulverizing of the hard lump clay soil enables the plants to get the food that it contains, and which they could not get from the hard clod, because their roots could not penetrate it. Pulverization of the soil deeply admits the air, and the oxygen of the air is a very efficient aid in rendering the plant food in the soil available. There are three things necessary in the soil that any seed may germinate or any plant root thrive—these are oxygen, moisture and a proper degree of heat. If any one of these is absent the plants will not thrive. Thorough plowing and preparation of the soil enables it to hold moisture, and the air penetrating it increases its warmth. Our red clay uplands dry out quickly after a rain and wash into gullies because of the shallow plowing of the past and the deficient preparation of the soil. The methods of cultivation have aided the droughts in their effect on the crops, and have helped to cause the washing of the hills. When the soil is broken but three or four inches, and the hard clay below is left unbroken, our deluges of rain soon fill the shallow broken surface and put the soil into a creamy condition, and down the hill it goes, because there is nowhere else for it to go. It is easy to see that a soil loosened twelve inches deep will hold three times as much water without running as a soil broken but four inches deep. Deep breaking of the soil will do more towards checking the washing of the hills than all the terrace banks that can be constructed. Then, the methods of cultivation practiced are also responsible for the failure of our soils to retain moisture and for facilitating washing. The corn is planted on the shallow broken soil and is cultivated and laid by with a plow throwing ridges up to the corn and

making channels all around the hill to fill with water. Then in heavy rains these channels fill, and one after another breaks over with increasing head, and a gully is started. Now, if the land had been deeply broken in the first place, and the cultivation of the corn had been as shallow as possible and the land kept flat and not ridged, no head of water would collect anywhere. Some imagine that a bank of earth thrown up to the corn keeps it from blowing down, when in fact it makes it blow down more easily. The plowing cuts the roots, taking off the only parts of the roots that are getting food from the soil, the extreme tips with root hairs on them, and the earth is thrown up to dry out, when the moisture would have been retained if it had been shallowly worked and kept flat. The brace roots will get a strong hold on a level surface, but throw a furrow to these with the plow, and the plant tries to throw out another set, which fail to reach the ground, or reaching it, fail to get a strong hold on the sloping bank, and the corn suffers from loss of roots and of moisture and blows down worse from its weakened condition. Deep breaking is necessary, as we have said, to enable the soil to retain moisture, and shallow cultivation is just as important in this retention of moisture. When the soil has been deeply broken we want it to settle and establish a capillarity that will be continually bringing up moisture from below in dry weather. Now, if the surface is allowed to crust, this capillarity is continued up to the air and the moisture passes off. But if we stir the surface soil shallowly we form a mulch of soil right at the surface that checks the upward tendency of the soil moisture and holds it right where the roots need it. In a field that has been properly broken and cultivated you can, in the driest weather of summer, stir the soil with your shoe toe and find moisture. But if we turn in a plow and throw up the soil from below, we break off the capillarity that is bringing up the moisture and expose the soil, that would be kept moist in shallow culture, to the drying effects of the outer air, and the mutilated corn suffers not only from the damage to its roots but for lack of the moisture it could have had with proper tillage. Deep plowing is an important matter on our upland soils. Our red clay is all soil, as I have often said, down to the fast rock, and only needs the oxidizing influence of the air and the pulverizing of the winter frosts to make it good soil. I have graded off this red clay fifteen feet perpendicularly, and to-day on that graded clay there is as fine grass as grows anywhere. At the College in Raleigh there is a fine growth of grass and shrubbery on land that was excavated four or five feet deep in the construction of a building. When the College first started I was anxious to get grass as soon as possible on the campus, and hastily plowed the land and seeded it to grass. The only grass I got was on some red clay thrown out in the digging of a well that was used in the building of the College. Noting this, I had the whole land plowed deeply and the rocks picked off, and sowed peas on the land. These were plowed under when dead and the land well prepared and seeded to grass, and to-day, after fourteen years, there is no finer sod anywhere than on the College lawns, which are the admiration of every one. I would not advise too deep turning at once on land that has always been plowed shallow. Only go about an inch deeper at each plowing; but break deeply by running the subsoil plow after the breaking plow.

The season for deepening the soil is always in the late fall. At that time the subsoil is drier than at any other time. It is usually not well to subsoil land in the spring. The work then is rushing and the farmer has not the time

to do the work properly. Then, too, while the surface soil may be dry enough to plow, the subsoil is apt to be wet, and the subsoil plow would simply puddle it and make it harder for the water to pass through than before. Lands that need drainage, such as crawfishy bottoms, should not be plowed deeply till drained. Deep sandy lands are not benefited by subsoiling, but should be plowed fairly deep, and the effort made to establish a hardpan at the depth of plowing, to render them more retentive. But in all of our upland in the South the rule should be deep breaking and shallow, level cultivation. Shallow plowing and constant cultivation in hoed crops that have burnt all the humus out of the land have made terraces necessary as a temporary expedient. But if the land is plowed properly, and cultivated properly and a proper rotation of crops maintained to restore the humus to the land, there would be no need for terraces or hillside ditches. It is through the proper rotation of crops that the humus of which the soil has been robbed is to be restored. We all know that land when first cleared from the forest does not wash, and that it does not suffer from droughts like the old worn land. We hear a great deal about worn-out land. The fact is we have no worn-out land. Land that was once fertile and of a good mechanical composition cannot be worn out. We have lands in the sand hill section that never had anything in them to wear out, but our upland red clay soil cannot be worn out. Much of it is in a very unproductive condition through bad management, but it is far from being worn out. Turn out one of these old fields, and nature at once sets to work to cure man's waste. She covers the old field with broomsedge to shelter it from the sun. Down among the broomsedge the wind blows the pine seed, and a thicket grows up. The pine tree has a wonderful subsoiling tap root, and it pumps up the plant food from below, where the little plow of the past failed to reach, and spreads its leaves over the surface. Then, after a while, some one clears the land again and finds a piece of fresh and fertile soil, and no fertilizer man ever had anything to do with its restoration. Of course we cannot wait for this slow process of nature, but we can learn from nature's method what is needed in the soil. It is humus, or vegetable decay. A soil well supplied with humus is productive not only from the plant food that may be contained in the decayed matter but because the humus makes it more retentive of moisture and thus enables it to more thoroughly dissolve the plant food in the fertilizers applied. Humus is also important in the mechanical mellowing of the soil, making it darker in color and warmer and preventing its running together and crusting badly, as old soils do. The restoration, then, of the humus is the most important matter in connection with the improvement of the soil. How, then, can we economically restore the wasted humus? By the growing of forage crops and the feeding of stock to furnish manure for the land. No system of farming that ignores the growing of forage and the feeding of cattle can be permanently successful, and the farmer who fails to do this is not farming right, no matter what his money crop may be. It has been well said that the difference between the Carolinas and Texas is that Texas, while producing the bulk of the cotton crop, feeds three beeves for every bale of cotton produced, while the Carolinas grow three bales of cotton for every beef they feed, and until we change this ratio there will be no permanent improvement in the land. It has been said that fertilizers should be used only for the production of a crop. They have been used in this way in the South for generations, and all the while the farmers have grown poorer

and the fertilizer manufacturers richer. The proper use of fertilizers for the improvement of the soil of necessity involves a judicious rotation of crops, in which the humus-making, forage, legume crops are brought frequently on the land. It is often said that the South needs grass. We need legume forage worse than grass. The wonderful capacity of our soils and climate for the production of these crops that feed the stock while feeding the soil indicates the line of improvement that should be adopted. With a standing pasture of Bermuda grass, the finest pasture grass in the world, we need not attempt to grow grass on our cultivated fields, but get the finest of hay from the cowpea, soy bean and other legume crops, that will enable us to feed cattle economically and get a benefit to our soil by the growing of the crop. Then by feeding the forage we can recover the larger part of the fertilizer value of the crop. It is only in the first start, in the improvement of a worn piece of land, that it can pay the farmer to return the whole growth of the legume to the soil, for when the land is capable of producing a ton or two tons of pea-vine hay per acre, its feeding value is too great to make it pay to use it as manure direct, when we can make a profit from the animals fed and get a large part of the manurial value back on the land. One of the most common questions asked us by farmers is: What fertilizer formula shall I use on my soil? No one can tell you the needs of your soil. The chemist can tell you what it contains, but cannot say in what condition the plant food is. Only by experimenting on the soil itself can you tell what it needs. As a general rule, I believe that our red clay soils seldom need any application of potash, if a proper rotation of crops is practiced and lime is used in moderate quantities at intervals. Then if a proper short rotation is practiced, and legumes brought frequently on the land, I do not believe that for the purposes of the cotton or grain farmer there will ever be need for his buying an ounce of nitrogen or ammonia. This will bring us down on the red clay lands to the one element of phosphorus in the form of phosphoric acid. Now, if we use on these lands a liberal application of acid phosphate on the pea crop, the peas will do the rest, you may depend upon it. In many sections of the tobacco belt the growers are of the opinion that peas preceding a crop of tobacco will injure the quality of the tobacco. They certainly do not injure some kinds of tobacco, and in the bright tobacco section I am of the opinion that the trouble arises from the fact that the growers do not realize the amount of nitrogen the peas give them, and they apply the same fertilizer they would without the peas, and thus get too rank a growth. It may be well to put another crop between the peas and the bright tobacco, or use a fertilizer with a smaller percentage of ammonia, or none, after the peas. But if I could not grow tobacco and improve my land with legumes and the feeding of stock, I would grow some other money crop that would let me improve the soil. The same objection is common with the peanut growers, and yet one of the most successful peanut growers I know of uses peas regularly for the improvement of his land, and is thus enabled to use lime more beneficially for his nuts, and he grows larger and better crops than the men who are afraid of cowpeas.

To sum up, then, the improvement of our lands depends on deep and thorough plowing, good tillage and fining of the soil, a proper short rotation with legume crops for forage and soil improvement, and an economical use of fer-

tilizers, simply using them to help the crop that helps feed the stock and the land alike. The wheat crop especially is one that demands a careful preparation of the soil. If the land has been plowed well for corn or tobacco it is never advisable to replow it late in the fall for wheat, but simply by the repeated use of the cutaway to make the surface as fine as possible and let the settled soil remain unbroken. Late plowing for wheat is always a disadvantage, for the soil does not have time to get as settled and compacted as wheat needs for the best results. Another point which is too often neglected in the South is the keeping of a green cover of some sort on the land in winter. Our soils waste rapidly in the winter rains if there are no growing plants there to catch the fleeting nitrates that form in the soil. Any green crop, even rye, will stop this waste and enable us to return the organic matter to the soil, and thus aid in the recovery of the humus. But crimson clover, vetch and like winter-growing legumes are far better. With cowpeas in summer and some of the winter-growing legumes in winter we can feed stock economically and rapidly improve our soil. I feel that I have skimmed the surface, and that there is a great deal that might be added if time allowed.

VARIETIES OF CORN AND COTTON AND THEIR IMPROVEMENT BY SEED SELECTION.

By C. B. Williams.

In our variety tests on the Department's test farms during the past three years we have had some very striking as well as very valuable results. In our test last year at the Edgecombe farm, which is located on a fine sandy soil underlaid by a reddish-yellow sandy clay subsoil, at a depth of from eight to twelve inches, we found that the varieties that gave the highest yield were, for corn, *Cocke's Prolific* and *Weekley's Improved;* and for cotton, *Russell's Big Boll* and *Culpepper's Improved.* Of the twelve varieties of corn tested, the difference between the highest and lowest yield per acre on the same type of soil, with identical cultivation and fertilization, was 15.2 bushels; while for cotton it was 790 pounds of seed cotton. Placing corn at fifty cents per bushel and seed cotton at three cents per pound, this will give us a clear gain per acre in favor of the best variety of corn over the poorest of $7.60 and for cotton $23.70. In the light of these results it is evident that the testing of varieties of agricultural crops is of fundamental importance in all experimental farm work. In our work on the improvement of corn and cotton by seed selection we have started with the best varieties as ascertained by actual tests in the field through a sufficient number of years to eliminate weather conditions. It must be borne in mind that in all plant improvement the same principles and practices that have been employed with such striking results in the improvement of the different breeds of animals must be followed.

For corn there are three general methods of improvement: First, by importation of seed from some reputable breeder or grower; second, by the careful selection of seed corn from one's own field or from a neighbor's; third, by careful selection and growing of seed corn in a field isolated something like four or five hundred yards from any other cornfield.

The characters that should be taken into account in the improvement of corn by selection are:

(1). Selection of ears from stalks bearing two or more ears, as it has been demonstrated time and again that two medium-sized ears from a stalk give higher yields per acre than one large ear.

(2). The stalk should be large at the base and tapering gradually towards the tassel, for two reasons: First, because it will be better enabled to withstand drought, and second, because it will stand better in windstorms.

(3). The ears should by all means be of a cylindrical form, with both butts and tips filled out, as this is the form that gives the highest percentage yield of shelled corn per ear. The difference in yield, as a result of experiment at the Missouri Experiment Station, of ears of the same length between those that had the tips filled and those that were not was close to six bushels per acre.

(4) The best-shaped kernel is a medium wedge, as this fills out the space on the cob better. Also the distance between the rows of grains should be small, while the number of rows should be large and run parallel the full length of the cob, with little or no diminution in size either at the butts or tips.

In the instance of cotton it is of the highest importance that the seed be selected also from plants in the field, having especial reference to total yield of seed cotton, percentage yield of lint, date of maturity, vigor, hardiness, form and size of leaves, stalks, limbs, etc., because here also, as with animals, like has a decidedly strong tendency to produce or beget like. Above all things, the practice of selecting seed at random at the gin should not be followed, for it cannot possibly be known whether the seed secured in this manner were produced on stalks that bore few or many bolls. If seed of the former kind are obtained, then the tendency of these seed when planted will be to produce a small yield, and *vice versa*.

In selecting a variety of cotton, one must not be guided entirely by total yield of seed cotton, as often between two varieties producing about the same yield, the one with the smaller yield should be chosen because of its greater production of lint, which sells for from eight to twelve times as much per pound as seed.

PROFESSOR MASSEY said:

I would like to add to what Mr. Williams has so well said, in regard to the improvement of corn by selection, a few additional ideas. Hereditary tendencies are strong in both plants and animals, and in any plant improvement we must endeavor first to break up the bad tendencies the plant has inherited and to establish a new heredity that tends toward improvement. The selection of seed corn in the past has had reference only to one feature of the plant, a large ear. Now, in any rational plant improvement, we must take the whole plant into consideration. Selecting simply for the big ear, we get that, but along with it other undesirable features in the plant. The big ear was either the sole ear on the plant or the top one on a plant that bore two ears. In either event the inherited tendency has been to get the ears higher and higher from the ground, with the ears on good land almost out of reach, and a small top above them. This style of plant necessitates wide planting and the crop has a top-heavy tendency to blow down. With corn that bears a single ear and has to be planted six feet apart a big crop is an impossibility. The first thing, therefore, in the improvement of corn in the South should be to improve its stature, to get the ear nearer the ground and a taller top above it, so that the plants can be grown nearer together. Select plants that have had the bad influence of barren stalks around them removed, that have made two ears, and then take the lower ear of these till you get the corn into a better stature, when both can be used to advantage. The lower ear has inherited a tendency to make another ear above it and to get nearer the ground, while in the top ear there is the opposite tendency. Form an ideal of the plant you want to produce and work steadily towards it. Hereditary tendencies cannot be overcome in one or two seasons. It takes years of patient work to establish a new heredity and to break up the old. But if you work annually towards the same ideal you will finally get what you want, and having the ideal plant, you can devote more time to the particular shape and development of the ear itself.

SOIL IMPROVEMENT.

By B. W. Kilgore.

There is no question before the North Carolina farmer to-day, or the farmer of any of the older States, of more far-reaching importance than that of soil improvement. The first step in the improvement of soils is to keep the soil where it is, and prevent it from being washed away by our heavy rainfall. Plowing to a depth of about four inches is the rule rather than the exception in North Carolina. This limits the feeding area of the plant, practically, to four inches of soil, which must also absorb and hold the larger portion of the rainfall which does not run off. This four inches of soil will take up, as does a sponge, a certain amount of water. When enough has fallen in the rain to give it all it will hold, the remainder must escape in some way, and does this by first accumulating just under the plowed land and along the unbroken soil. As this volume increases, especially if the land be rolling, as it is with most of our Piedmont area, the soil is gradually moved along until large portions of the cultivated soil are thus washed away into the valleys and the streams. If land were plowed to a depth of eight instead of four inches, the plant would have double the amount of soil from which to get its plant food, and the broken land would also hold twice as much water as when there were only four inches. In like manner, by plowing to a depth of twelve inches, which should not be an unusual one, the feeding area of the plant is trebled, as is also the water-holding capacity of the soil. It needs no argument to show the value of thoroughly breaking the land to increase its productiveness and to prevent it from washing away. Before plant food can feed the plant it must first become dissolved in the water in the soil so that it may enter the very fine root hairs. By thoroughly breaking, the particles of soil are made finer, which enables the double or treble quantity of water in the soil to dissolve more plant food than if it were in a coarser or unbroken condition, and there is also double or treble the quantity of water for dissolving this plant food over what there is where the land is plowed only to a depth of about four inches. It takes time to thoroughly pulverize a surface soil and get it in the best condition for feeding the plant. If the surface soil is removed in part every year by rains, it means that a new beginning must be made on a new soil each season and thus reduce the amount of plant food for the growing crop of that season. Thorough breaking of the land to a good depth will keep the soil where it is, and with thorough cultivation the state of fineness will increase from year to year, with good, thorough cultivation. There is no question of the growing importance of this treatment in the improvement of the soil.

Further methods of preventing the washing of lands and keeping the soil where it is, are by terraces and hillside ditches, the former being preferable where the land is not steep.

The second step in the improvement of soils is the growth of soil-improving crops, like the cowpea, crimson, red and burr clovers, vetch, soja beans, etc. As stated in the article on fertilizers, the most costly constituent which the

farmer has to buy in fertilizers is nitrogen, and four-fifths of the air is made up of this constituent. Ordinary crops like cotton, corn, the grains and tobacco, cannot use this nitrogen as it exists in the air in their growth. The soil-improving crops mentioned above can use this nitrogen by the aid of the extremely small micro-organisms which exist in large quantities in the nodules, tubercles, or warts on their roots. These organisms are able to take this nitrogen from the air as it penetrates the porous soil and put it in such shape that the plants can use it in their growth, and after they die on or in the soil, the nitrogen is left in such form that cotton, corn and the grains can also use it. The nodules on hairy vetch and burr clover in which these organisms live and obtain their nitrogen are shown in the accompanying cuts. The cowpea has nodules of a similar kind, and in a good, average crop of about one ton of pea-vine hay per acre there is in the hay about 48 pounds of nitrogen (58 pounds of ammonia), or nearly as much as is found in 1½ tons of an 8-2-2 fertilizer, or in one ton of an 8-3-3 fertilizer. This nitrogen has a value of about $8.00, on a basis of what the same amount of nitrogen would cost if purchased in cotton-seed meal, dried blood, or other fertilizer materials. The phosphoric acid and potash in a ton of hay would bring this fertilizing value to fully $10.00. A considerable portion of this nitrogen is obtained from the air, without cost to the farmer.

For the hot months of the year the Southern farmer could not have a more important plant for soil improvement than the cowpea, but its work is limited to the warm season. We have recognized in our experimental work in the Department of Agriculture that one of the most, if not the most, important problem was to obtain soil-improving crops, which would supplement the work of the cowpea by growing and enriching the land during the fall, winter and spring months. We have found in burr clover and hairy vetch two such plants. Burr clover may be planted in cotton or corn before the last cultivation in late July, or early August, the cultivation continued as if it had not been sown, and in the fall it will come up and furnish light grazing during the fall, a very large amount of grazing in the spring and then mature seed to reseed the land in time to plant corn, and by a special method, also cotton. The best cotton and corn we have this year on our test farm in Edgecombe County is on land which grew last year for the first time a crop of burr clover. The cotton and corn had no fertilizer except acid phosphate and kainit. The results of these tests will be given, likely, in the February, 1904, BULLETIN, as well as the method of planting and growing the crops. It will be well worth the while of all farmers in the State to carefully study these results.

The other winter-growing soil improver—hairy vetch—is also sown in the early fall, from the first of September to the middle of October, and will produce a crop of hay about the middle of May, or seed about the middle of June. It grows best with one of the grains, as oats, rye or wheat. It is an excellent hay, and the roots which are left behind, as in the case of the pea stubble, will greatly improve the land.

As these crops gather their nitrogen from the air, without cost to the farmer, this constituent need not be applied to them in fertilizers, at least, on land of ordinary fertility, and they only need the cheaper fertilizer constituents, acid phosphate and kainit, or some of the other potash salts.

NODULES ON HAIRY VETCH ROOTS.

NODULES ON BURR CLOVER ROOTS.

As indicated in the experiments referred to above, the nitrogenous portion of the fertilizer may be omitted largely or entirely in applications to cotton, corn and other crops after clovers, peas, etc., have been grown, thus reducing the fertilizer bill by about forty per cent.

If our lands, which, as a rule, have a large amount of plant food already in them, but not in a readily available form, can be kept where they are, deepened and pulverized by good plowing and cultivation, and enriched by the addition of nitrogen from the air in the growth of leguminous crops, in a reasonable number of years, by a careful system of rotation, any land can be greatly increased in productiveness, if not indeed brought into a high state of cultivation.

COMMON DISEASES OF FARM ANIMALS.

By Tait Butler.

The prevention of disease is receiving more attention to-day than any other phase of medical science, and it is also this part of veterinary medicine that is of most importance to the stock owners of North Carolina. For, when their animals get sick, few of them have available a competent veterinarian to treat them. Moreover, the most common diseases of farm animals are almost entirely preventable by intelligent feeding, good care and regular but not excessive work.

Probably more horses and mules die from diseases of the digestive organs—so-called colics—than from any other cause. These diseases are almost entirely the result of errors in feeding and work. For instance, if a harder day's work than usual is expected of a horse he is given a larger feed, when he should be fed less. Or, perhaps, the change is made from farm work to the road, but the usual heavy feeding continued, when it should have been decreased. In short, a full feed should never be given on a change of work, nor a change of feed on full work, and, certainly, when a change of feed and work both become necessary the quantity of one or both should be decreased. Again, a large feed should not be given just before or immediately after severe exercise or hard work, and especially should large quantities of hay and water be avoided just before fast work.

Cases of colic are rare in the morning before breakfast, but especially common at the end of the day's work or early part of the night.

The stomach of the horse is very small in proportion to his size, and it is, therefore, probably better to water before feeding and to give little or no hay except at night. In fact, I am convinced that much more hay is fed than is either necessary or good for the health of our horses. If a good, liberal supply of hay be given at night none is needed either at morning or noon, and the horse will keep in better flesh and health without it.

By giving more attention to care and feeding less use will be found for medicines. Moreover, much harm is now done by the excessive and ignorant dosing of farm animals with medicines of the actions of which those using them know nothing. It is my opinion that the medicines given to farm animals in North Carolina do more harm than good. In other words, I am convinced that many more cases would get well if left alone and nature allowed to repair the injury unobstructed than do now under the custom of giving everything any person may suggest, whether or not he knows anything about the disease from which the animal is suffering or of the medicines he is prescribing. And let me say right here, that no man can prescribe intelligently for the diseases of live stock unless he has had a veterinary medical education, I care not how much experience he may have had in the care or handling of animals. I sometimes hear men give as evidence of their fitness to treat horses the fact that they have handled or cared for horses all their lives. These men would not presume to treat the human family, and yet it is to be hoped they have associated as intimately with men as with horses. The care

and handling of horses no more fits a man for treating their diseases than does the association with men fit one for treating their diseases. Therefore, I again urge that if you have not a really competent veterinarian available, permit nature to do her best to repair the sick animal instead of giving medicines which are as likely to prevent recovery as aid it. Of course, sometimes animals get well in spite of this sort of treatment, but it is asking too much of the animal system to require it to throw off the disease and the ill effect of improper medicines combined.

It is plain that in a short talk of this sort I cannot discuss even the *common* diseases of farm animals. I therefore prefer to talk to you about such diseases as are of local interest at this time. Is any one present particularly interested in some disease that is affecting the stock of this section?

Question: Tell us how to handle hog cholera. We want to know how to prevent it as well as how to treat it after it breaks out.

Answer: This disease is well known to be caused by a "germ," and without the introduction of that "germ" hog cholera will not occur on any farm. Those who doubt that fact or who will not act upon this view of the disease, for them no intelligent means need or can be given for excluding the disease. The germs may be conveyed by almost anything that may be carried from one farm to another.

Hogs sick with cholera, or well hogs that may have come in contact with anything contaminated by sick hogs, may carry the disease.

Buzzards and other birds that feed on hogs dead from cholera are common means of spreading the infection.

The germs are also very frequently carried on the feet of people walking from an infected farm through the hogpastures of another.

Less frequently other agencies serve to spread the disease. A stream that runs through a farm infected with hog cholera may carry the disease to the farm below. The wind might occasionally blow the germs a short distance. To exclude these and all other means of carrying the disease is the point to be aimed at. This is always more or less difficult and sometimes practically impossible, but much may be accomplished by intelligent care.

During the existence of cholera in the country no hog should be allowed to come on the farm not yet infected. In fact, at any time, hogs new to the farm should be kept separate from all others for at least thirty days to prevent them introducing disease.

The local authorities should see that all hogs dying of disease are either burned or buried deeply under about two inches of lime and three feet of soil.

All communication should be prohibited between hog pastures or lots during the existence of the disease. Pens or small lots are better during the existence of the disease than large woods pastures, because more easily guarded from possible infection.

The hogs should be given a variety of food, including something green if possible.

Keep all pens and lots as free of dust and mud-holes as possible.

Keep under a shelter, where the hogs can have free access to it, the following: Two bushels charcoal, one bushel hard-wood ashes, two pounds salt, one pound copperas.

The charcoal should be broken up in small lumps and the copperas powdered, and all mixed thoroughly.

If the disease breaks out in the herd, at the first signs of sickness move the well hogs (not the sick one) to fresh temporary pens. These pens need not be large, for if another case develops it will be necessary to move the well ones again. This plan should be followed as long as new cases continue to develop.

Burn or bury deeply all hogs that die, and thoroughly clean and disinfect all pens and lots. As a disinfectant lime may be used for small lots, and pens may be washed with a hot solution of corrosive sublimate—one part corrosive sublimate to 500 parts of water.

There is but little use of treating the sick hogs, but the following is as good as any:

In the first stages, when the hogs are constipated, give three ounces of Epsom salts to every 200-pound hog. This is best given in milk. Follow with from five to ten drops of carbolic acid and a teaspoonful of turpentine in a little oil.

If the animal will eat, from two to four drachms of hyposulphite of soda may be given to advantage.

The pig lots should be so arranged with movable houses, that they may be changed every year and the ground cultivated before being used for hogs again.

All places exposed to sunshine and rain may be used again, after an outbreak, in the course of a few months, but pens and shelters should be thoroughly disinfected and left vacant for six months before being again used.

All sows that have the disease and will afterwards breed should be kept for brood sows.

Question: Do cattle have such diseases as "hollow-horn" and "hollow-tail"?

In reply to this question, it may be briefly stated that "hollow-tail" and "hollow-horn" are purely imaginary diseases, existing only in the minds of those not familiar with the normal and diseased conditions of cattle. A cow becomes sick. The cause and nature of the disease are naturally a mystery to those not educated in veterinary science. Being unfamiliar with natural as well as diseased conditions, it is not strange that they often mistake the former for the latter, while the true seat and nature of the disease is entirely overlooked. The human mind is prone to seek an explanation for every condition, but a fiction satisfies as well as fact where thorough knowledge of the question is lacking.

For the last fifty years, at least, some of the brightest men of this and all other countries have spent their entire energies and abilities investigating and studying the diseases of cattle, but not one of them has yet announced the discovery of the existence of "hollow-horn" and "hollow-tail" as diseased conditions.

It is not denied that the frontal sinus, a cavity of the head with which the natural cavity of the horn communicates, may become diseased and the effects extend to the horn, but this is rare and is not "hollow-horn." Likewise, the tail may receive a direct injury and show signs of disease, but this is also rare and is not "hollow-tail" or "grub in the tail," as the imaginary disease is sometimes called.

Ninety per cent of those cases called "hollow-horn" or "hollow-tail" which the writer has seen have been plain cases of indigestion or Texas fever (distemper), while the remaining ten per cent have usually been some one or another of many other diseases equally well known to the veterinarian.

I am well aware that some one will be ready with the reply that those who have had practical (?) experience with cattle know that these diseases do exist and that such is proved by the fact that when the animals are treated for these diseases they get well. I have merely this question to ask: Who is the more competent to judge of this matter, the stock owner who sees possibly eight or ten sick cattle a year and does not possess that technical education necessary to enable him to understand the problems involved, or the trained veterinarian who sees several hundred cases during the same period? Whose experience is the more "practical"? Even a large stock owner would not usually see as many cases in fifty years as many a veterinarian sees in one. This being the case, is it not strange that if these diseases really exist, outside of the minds of the laity, some veterinarian has not seen and recognized them?

But why do the cattle get well when treated for these diseases, and die if not? This is not entirely so. Many treated for these diseases die, while others not so treated get well. The explanation of the fact that cattle frequently get well when treated only for "hollow-horn" or "hollow-tail" is simple. They get well in spite of the treatment. In every animal organism there is a tendency to return to normal conditions, repair an injury, or get well if sick. Whether treated or not, many cases get well, and I regret to state that as medicines are used to-day in the treatment of live stock in this State, those not treated generally have the best chance for recovery. Moreover, it may be stated, in explanation of conditions which many people believe to indicate disease, that all horns are more or less hollow. Old animals, thin in flesh and with large horns, are apt to show the largest cavities, but young animals, in similar condition and with horns of equal size, will show variations in the size of the cavities.

That the horns, as well as other extremities, become colder than usual when the animal is weak from disease of any sort, is also admitted, and the conditions which are usually termed "hollow-horn" are therefore either normal ones or symptoms of a variety of real diseases. Again, the last four to six inches of a cow's tail is naturally and always boneless. Just where the bones cease, or at the upper end of this soft, boneless portion, the tail is smaller and softer, to give greater freedom of movement of the switch in fighting flies, etc. This natural condition is the one that is usually thought to indicate "hollow-tail," except in those rare cases where the tail may be really injured or diseased.

In conclusion, it may be stated that when any portion of the body can be cut off and thrown away without causing any appreciable disturbance of health, it is safe to conclude that no invisible disease of this part will cause serious consequences.

THE HOME GARDEN AND ORCHARD.

By W. F. Massey.

The topic assigned to me for this lecture is entirely too broad to be well considered in the brief time we have at this institute. There is enough in it for several talks. Hence, my remarks must be of rather a general nature. All over the State as we travel I see the gardens that were made in the spring are now forests of weeds and dead cornstalks. Few seem to realize that in our climate we can have an all-the-year-round garden. In my own garden there is not a day in the year that I do not get some fresh vegetables for the table. Parsnips, salsify, carrots, green onions late in winter and spinach and kale all winter through are some of the things I have. Then, with the aid of glass sashes, I have lettuce finely headed from December till May. Chinese rose-colored winter radishes I get from the open ground all winter by sowing the seed in late September or October and simply protecting them with a little coarse manure in the cold weather. My garden is kept clean all the year through, and this means an exemption from cut-worms, for the moth that produces cut-worms lays eggs in the weeds and grass in neglected gardens, and when my neighbors are worrying over the cut-worms I seldom find one in my garden. It would take too long a time to go into details of culture and I will not attempt it. I have a bulletin on gardening which will soon be published and in which I hope to give these details in full.

Now, as to the orchard. The trees one sees in passing through the country, especially the apple trees, give fruit in spite of absolute neglect. Where this is the case it is evident that the proper care of an orchard will make it a source of profit. While the region west of the Blue Ridge is emphatically the apple region of the State, the whole of the central upland country will grow good apples if proper care is given them. In planting an orchard of any kind of tree I always prefer to get one-year-old trees. Nurserymen usually sell apple and pear trees at three or four years old, and with these it is hard to establish the head properly, for the nurseryman has topped them back and there is an irregular head started, always too high from the ground, for he knows that people look for tall trees. The one-year apple tree is a mere switch full of live buds from top to bottom. Now, the most important matter in an orchard tree in our climate is a low head. When I see the tall-headed trees about the country and ask men why they have them so tall, they say that they must have the heads tall so as to get a horse under them in working them. Now there is no need whatever of cultivating right up to the tree trunk, for all the feeding roots of a tree are out beyond the spread of the limbs, and if the soil is cultivated that near, it is near enough. Trees headed tall are easily blown over, and it is far more difficult to gather the fruit than from a low-headed tree. In my peach orchard one can stand on the ground and gather every peach from the tree. I head all trees in the orchard about twenty inches from the ground. Look at the tall-stemmed trees usually seen in young orchards and you will find on many of them the bark dead from sun scald on the southwest side. With a stem but twenty inches tall it is easy to

protect the stem till the top shades it, by sticking a shingle on the southwest side, while it is hard to protect the tall stem and it is longer in getting top enough to shade it. In setting an orchard it is of course necessary to prepare the land well. Never make any holes for the trees deeper than the plowing of the land, for in that case you will find that the water will stagnate in these holes and injure the tree. Never put any fermenting manure in contact with the roots of a tree. Put it on top of the land after the tree is planted. In digging the trees from the nursery the fine hair-like feeding roots will all be dried up, and it is necessary to get them renewed as soon as possible. Therefore I prune the roots to about six inches long, as the new fibres will start more readily from a smooth-cut surface than from a dried-up fibre. In planting, set the tree a little deeper than it stood in the nursery, to allow for the settling of the soil, which will leave it at about the same height it grew. The soil should not be wet, but rather on the dry side. Work the top soil in among the roots and ram every inch as tight as though setting a gate-post, thus helping in the retention of moisture and shutting out the drying influences of the air. Autumn is the time for setting orchard trees in our climate. Our soil does not freeze deeply and the trees will be making new root fibres and hairs in the winter and will be ready to commence growing with the first breath of spring, while if set in spring the warm weather will come on them too suddenly before new feeding roots are formed, and the stored-up sap in the trunk may be exhausted before new material is furnished from the roots. After the trees are set, cut back to about twenty inches from the ground just above a good bud. In the spring, when growth begins, go over the trees and rub off all shoots that start except three or four near the top, which are to form the head of the future tree. An open-headed tree is best in this climate. North, where winter snows are heavy, it has been found best to have a central stem with limbs produced around it, but here a properly pruned open-headed tree is far better, for if pruned right and the crop distributed over the tree there will be no danger of these spreading heads breaking down. Never allow any water sprouts to grow in the center of a tree, but rub them out when they start and save the cutting out of big limbs in the winter. The second year shorten back the young growth one-third and keep this up annually till the tree is formed, after which little or no pruning will be needed that cannot be done with finger and thumb. During the early years of an apple orchard, growth is what we want. Therefore the orchard should be carefully cultivated in some low-growing truck crop and well manured. Cultivation should stop by July, as the growth of the season is then made and late cultivation will induce a late sappy growth that is injurious. In July sow the orchard in peas to remain on the land, and have crimson clover sown among them as the leaves fall, so as to make a winter soil cover and a crop to plow under for the trees in spring. When the trees are well developed and should come into bearing, give them a check in growth by seeding down in grass. Sow the grass for the trees alone and not to make hay from nor to use as a pasture. Mow the grass several times in the summer and let it remain as a mulch to the trees. In short, grow an orchard for fruit and nothing else, and you will have fine fruit. The only animal that should be allowed in an orchard is a pig, with his nose jewelled to prevent rooting. The pigs will be useful in destroying the wormy fruit. Very similar treatment is given the peach orchard, except that as a rule the short-lived

peach tree is cleanly cultivated till July during its whole life and seeded in peas and clover to be turned under in spring. The peach bears its fruit on the previous year's wood. Hence, it is necessary in pruning to head back the young shoots annually to get shoots distributed through the tree and to prevent the long, naked limbs so commonly seen on old trees, with the fruit-wood only at the ends of the limbs where a full crop will split them down. In planting peaches for market, you must use budded trees. Some insist that the trees raised from seed are more hardy and long-lived than the budded trees. But, be this as it may, if you plant seedling trees for market, and ship the fruit it will bring a lower price, because it is seedling fruit, no matter if it is good. The city markets demand known varieties. Then, too, if you plant seedlings you will have trees of all seasons mixed together and will have trouble in going back and forth to find the ripe ones. Planting budded trees, you plant a block of the earliest and then the next early, and so on through the season, and when you gather them you clean up a variety as you go, and the market knows what they are and will give a good price for them, if of fine quality. Pears and plums we treat as we do apples. Pear trees in grass never blight as badly as those in cultivated land, and hence we always put pear trees in grass as soon as the trees have developed to a good size. It is a necessary thing for success in fruit growing in these days to be provided with a good spraying apparatus and to spray the trees regularly, both to destroy insects and to ward off disease. The subject of spraying for various purposes is too large a theme for me to take up at present, and in a future talk I may make this the entire subject. With the great increase in fungus and insect troubles the orchardist who neglects spraying will certainly get left. In regard to one fungus disease I may say here that the presence of cedar trees near an apple orchard is always a menace to the trees. The knots called cedar apples on the cedar trees are the winter home of the fungus that causes the leaf rust on the apple tree. In the spring these so-called cedar apples throw out long worm-like growths, which are the spores of the rust. These dry up and are blown on the apple trees and there make other spores called the rust. These blow back in the fall to the cedar trees and start more cedar apples. If your apple trees lose their leaves from rust in summer, look and see if there are not cedar trees near by. Destroy these and you may be able after a while to get rid of the rust by spraying. The Station has recently issued bulletins on orchard culture and spraying, which those interested can get and which will supplement this brief talk.

THE CATTLE TICK AND THE QUARANTINE RESTRICTIONS.

By Tait Butler.

The cattle ticks cost Southern cattle owners millions of dollars annually. The truth of this alarming statement is plain from a most superficial examination of the abundance of positive evidence at hand. Still, thousands doubt even the positively established fact that ticks carry the germs which cause Texas fever, or "distemper," as it is called in this State; while thousands of others, notwithstanding all that has been published on the subject, are entirely ignorant or careless of the most simple facts concerning this, the most important question relating to the cattle industry of the South.

Cheap lands and a suitable climate, which insure long grazing seasons and unequalled facilities for the growing of forage crops, are real and important advantages possessed by the South in the production of cattle, but all of these are more than offset by the direct losses caused by ticks and the indirect but more serious losses from the market restrictions which their presence causes to be imposed on all cattle raised south of the National quarantine line.

NATIONAL QUARANTINE LINE.

After it became established that ticks infesting Southern cattle carried the germs of Texas fever, the National government established a cattle quarantine line extending across the country from the Atlantic to the Pacific Ocean, located so as to place all tick-infested territory south of said line. The shipment of cattle from south of this line to any point north of the same is prohibited except for immediate slaughter and then only under certain severe restrictions.

In maintaining such a quarantine line the Constitution of the United States confines the National government to State lines or interstate traffic; therefore, if any part of a State was found infested with ticks the whole State was placed under quarantine, unless the State authorities made satisfactory provision for guarding lines established within its borders. In such cases the Federal authorities exempt any portion of a State found free of ticks. Upon this basis, the State Board of Agriculture agreeing to guard the line across this State, the Federal authorities have exempted the following counties of North Carolina from all cattle quarantine restrictions: Cherokee, Clay, Macon, Jackson, Transylvania, Henderson, Graham, Swain, Haywood, Buncombe, Madison, Yancey, Mitchell, Caldwell, Watauga, Ashe, Alleghany and that part of Burke north of the Catawba River.

WHAT THE FEDERAL QUARANTINE RESTRICTIONS COST THE CATTLE OWNERS OF NORTH CAROLINA.

When cattle are shipped from eighty counties of North Carolina to any point north of the Federal quarantine line, where they must go to reach the best markets, they must be sold for immediate slaughter or go back south of the

line. That is, they are not allowed to go on to Northern pastures nor into Northern feed lots. The advantages taken of these facts by the buyers, and the cost of other conditions and restrictions imposed, cause our cattle to sell fully one-half cent per pound less than those of the same quality not subject to these quarantine restrictions.

A car-load of cattle, weighing 24,395 pounds, was recently shipped from below the quarantine line to Richmond, Va. They were compelled to go to the Southern or quarantine division of the stock yards, because they came from a section where ticks exist on probably one-fourth the farms, although they themselves had never had ticks on them. A competent and reliable commission merchant was of the opinion that they sold for 30 cents per hundred pounds less than they would if they had been allowed to go into the Northern or free section of the yards. That meant a loss of $73.18 on this one car-load of cattle. If they sold for 50 cents a hundred less, as another man competent to judge thought probable, the loss was $121.97.

If we add to this certain and definite loss the somewhat indefinite but none the less certain cost of disinfecting and placarding all cars used for carrying Southern cattle and the cost of providing separate pens and unloading chutes, which the government requires, it is entirely safe to state that every animal of the cow kind sold by North Carolina farmers living south of the National quarantine line sells for fully one-half cent per pound less than it would but for the presence of the cattle tick.

There is a general impression that because few cattle are shipped to Northern markets, the effects of the quarantine are not felt on the local markets; but this is certainly a plain mistake. It matters not whether the cow be sold to a neighbor, the local butcher or a shipper, she suffers this reduction in price of not less than one-half cent per pound. For the price of cattle is fixed for the whole country at the large markets north of the quarantine line. In other words, what the cow will bring on the large markets, less the expense of shipping, is the price she will command on the local market or on the farm; otherwise some one would ship her. According to the last Census Report there were in 1899 about $1,060,000 worth of live cattle sold from the farms of the eighty quarantine counties. If we estimate the average price at 2½ cents, and the loss as stated above at ½ cent per pound, the total loss on cattle because of the National quarantine was one-fifth of $1,060,000 or $212,000.

The above conservative estimate approximately represents the loss to North Carolina from the direct effects of the Federal quarantine restrictions, but it does not by any means represent more than half the loss sustained from the presence of the cattle tick.

THE TICKS AN OBSTACLE TO LOCAL CATTLE TRAFFIC.

Anything which obstructs or renders dangerous a legitimate local traffic in cattle is a great obstacle to the improvement of the quality of our stock and the proper development of the industry.

The interference with local traffic is greatest in the territory adjacent to the quarantine lines, where they cross the State from north to south. The counties west of the mountains are largely devoted to cattle raising, and their cattle are far superior in quality to those in the eastern part of the State. Were it not for the quarantine restrictions and the presence of the tick, the

grain and grass-growing Piedmont section should rapidly develop an interest in cattle raising that would no doubt afford a market for considerable numbers of the better grade of cattle from across the mountains.

Moreover, several of the mountain counties are by the quarantine restrictions now cut off from their nearest and most suitable shipping points and are compelled to drive their cattle long distances into Tennessee and Virginia to reach a railroad point above the quarantine line. On the other hand, the grazing facilities of the mountain counties would, during the summer, afford a market for many of the best cattle from the adjacent counties on the other side of the quarantine lines were it not that such movement of cattle is prohibited except during the winter, when they are not needed. During the summer of 1902 an Ashe County cattleman informed the writer that he could buy cattle in Wilkes County for $10 per head that would be worth $20 per head if they could be taken across the quarantine line and put upon the pastures of Ashe and Alleghany Counties.

Throughout all that part of the State south and east of the Federal quarantine line, and especially in the forty counties having the stock law, wherein more than half the farms are free of ticks, those who buy cattle during the winter or spring to run on their pastures during the summer are frequently heavy losers from death by tick fever. Large, old pastures are quite likely to be infested and those having these tick-infested pastures cannot safely buy up cattle to graze upon them unless they are careful to secure immune cattle, that is, those from tick-infested farms. These can be picked out with a fair degree of accuracy by the plainly visible scars or pits which they bear, produced by the ticks during the preceding summer, but since many farms will always remain free of ticks and the cattle raised thereon will consequently be susceptible to tick fever, those with tick-infested pastures will always run great risks in buying cattle even from their nearest neighbors. Likewise those with tick-free farms must always be extremely careful not to introduce a tick-infested animal into their herds, or the loss will be most certain and severe. Scores of such instances of heavy loss, where the cause is a mystery to the owners, are reported to the State Veterinarian every year and in the aggregate amount to an almost incredible sum.

Another very common loss results from the taking of cows from the towns to the country and placing them on tick-infested pastures. Ticks are seldom found on cows kept in town, and hence these cows are generally susceptible to tick fever. When they are no longer profitable for milk production, or become temporarily dry, they are frequently taken to the country to pasture. If the pasture happens to be infested with ticks, as is usually the case with pastures used for such purposes, these town cows are almost certain to die from tick fever.

All these frequently recurring losses, which are often heavy and usually entirely misunderstood by those upon whom they fall, have operated to make the cattle business unprofitable, and in the opinion of the writer are chiefly responsible for the undeveloped condition of the cattle industry of the State.

DIRECT LOSSES CAUSED BY THE CATTLE TICKS.

Having briefly considered the indirect losses to the cattle industry of the State resulting from the presence of the cattle tick, those of a direct nature may now be mentioned, although we haven't time to discuss them fully.

These direct losses may be classed under three heads: First. The loss caused by the ticks sucking the blood and irritating the cattle and thereby retarding their growth. Second. The loss resulting from the obstacle the ticks offer to the improvement of the quality of our stock by rendering the importation of pure-bred animals for breeding purposes extra hazardous and expensive. Third. The loss by death from Texas or tick fever among native cattle.

What the exact loss caused by the ticks irritating the cattle and sucking their blood amounts to cannot be stated, but that it is considerable will be readily conceded by any one who has seen an animal badly infested with ticks and compared it with one receiving the same food but kept free of ticks. A man usually has only to learn of the presence of lice on his cattle to be stimulated to efforts to free them of those parasites, for he seems to fully realize the loss which they cause him; but either through a lack of appreciation of the damage done by the ticks, or the fancied difficulty of exterminating them, many men see their cattle literally covered with ticks week after week and year after year without making any effort to free them of these terrible pests. Certainly the ticks, being much larger parasites, when numerous do as great an injury to cattle as lice, and as great an effort should, therefore, be made to exterminate them.

THE CATTLE TICK AN OBSTACLE TO THE IMPROVEMENT OF THE QUALITY OF OUR CATTLE.

Such attempts as have been made in the past to introduce pure-bred breeding stock from the Northern States for the purpose of improving the quality of our native cattle, have met with heavy losses in the death of from 50 to 90 per cent of all animals two years old or over, soon after being placed on our tick-infested pastures. These losses were so heavy and certain that few have had the courage to take the risk in recent years. The progress made in developing a better grade of cattle has consequently been so slow that to-day our beef cattle bring from two to four cents per pound, while those of the Northern States fetch from four to six cents per pound on the same market.

HOW SUSCEPTIBLE CATTLE MAY BE BROUGHT TO NORTH CAROLINA WITHOUT DANGER OF SERIOUS LOSS FROM TICK FEVER.

Those who contemplate the introduction of cattle from north of the quarantine line, or from tick-free farms, should, if they have tick-infested pastures, either secure young calves or practice inoculation. If young calves, under five months, are brought South in the spring they acquire an immunity during the first summer, in the same way as the native calves, and the loss is small. Young calves, being only slightly susceptible to the disease, suffer from a mild attack and thereby acquire the ability to withstand subsequent gross tick infestations.

For many years yet portions of the State will remain infested with ticks, but in those very sections pure-bred bulls are most needed for the improvement of the quality of the cattle; therefore, the question of inoculation to protect imported cattle against tick fever is a very important one to the tick-infested part of the State.

In recent years there has been developed a form of inoculation which reduces the loss from tick fever to a minimum, and no one should expose an animal over six months old to tick infestation for the first time without having him inoculated.

In order to encourage the introduction of improved cattle, I will inoculate pure-bred animals for citizens of the State free of charge, except actual cost of food and care. When requested, I will also select and purchase such stock as any citizen of the State may need, and, when necessary, inoculate and ship to farmers at actual cost.

TEXAS OR TICK FEVER.

Only in recent years has full attention been called to the extremely heavy losses resulting from tick fever among native Southern cattle. Southern animals raised without tick infestation are as susceptible to the disease as those raised in New York or Minnesota, and the death loss among the native cattle, especially in those States just south of the Federal quarantine line, where ticks are less numerous than farther south, is probably greater from tick fever than from all other diseases combined. The loss in North Carolina alone is probably not less than $75,000 annually.

When ticks get onto susceptible animals the disease develops and the cattle die and are buried before the ticks become large enough to be seen by the average person without a close examination.

What you have been calling bloody murrain, dry murrain, distemper, hollow-horn, hollow-tail, etc., are practically all simple cases of tick fever. As there is no successful treatment for the disease, prevention by extermination of the tick or inoculation is the only method of dealing with the disease.

The disease may be recognized by the general symptoms of fever, the presence of the fever tick on aged cattle never before infested and the passage of blood-colored urine in the more severe cases.

HOW TO EXTERMINATE THE CATTLE TICK.

Since it is only with a full knowledge of the habits of the cattle ticks and the manner in which they breed that the proper means for their destruction can be devised and understood, the following facts should be carefully considered:

1. The full-grown female ticks, after filling themselves with blood, drop off the cattle and crawl under leaves, grass or any other material with which the ground may be covered.

2. In two or three days these ticks begin laying eggs, and lay from 1,500 to 2,500 during the next two weeks.

3. In real warm weather these eggs may hatch in three weeks, but the hatching may be greatly delayed or prevented entirely by cold weather.

4. The young ticks (seed ticks), although extremely small, are active, and crawl up the weeds, grass or twigs and wait for cattle to come along and pick them up.

5. Since these young ticks are not able to live longer without food, unless a cow, horse or mule brushes it legs against the object upon which they are waiting, within four or five months they will starve to death.

6. From the time the young ticks get on cattle until they are full grown and ready to drop off is about four weeks, except in cold weather, when they frequently remain on much longer.

7. Neither old nor young ticks crawl far, and a fence with a rail or board on the ground will certainly stop them, but wire fences do not always afford protection.

8. Ticks do not go from one animal to another.

9. Eggs laid before the first of September will hatch the same fall, and unless the young ticks get on cattle, horses or mules they will die of cold or starvation before spring.

10. Eggs laid during the cold weather of late fall and winter do not hatch until the warm days of spring. It is, therefore, the eggs and not the ticks that are usually able to pass through the winters of the northern and western portions of this State.

With the foregoing facts in mind three methods of destroying the ticks at once suggest themselves:

1. Keep all cattle, horses and mules out of the tick-infested pastures, lanes and lots after September 1st, and all eggs previously laid will hatch before cold weather and the young ticks starve to death before spring.

2. Divide the pasture by a fence with a rail or board tight on the ground, and the first year keep all cattle, horses and mules out of one-half after September 1st. The second year put the cattle on the half left vacant the year previous, and also provide new lanes and lots on ground over which no cattle ran the year before.

3. If practicable, burn the pasture over thoroughly early in the spring. Mix sulphur with the salt given the cattle—one part of sulphur to three parts of salt. Begin not later than April 15th greasing the legs and under parts of all cattle, and repeat it once a week all summer. While greasing the cattle look carefully for any ticks that may have escaped the grease or attached themselves to the upper parts of the body, and if any are found, pick them off and burn. The grease may be one part kerosene and three parts any cheap sort convenient, such as cotton-seed oil. If a little sulphur and tar be added the effect will be prolonged and increased. The grease prevents young ticks from getting on the cattle and kills those already on by plugging the small openings in the body through which they breathe.

If the greasing and hand-picking be done thoroughly and no ticks allowed to drop in the pastures, lanes or lots for four or five months during the warm season, the effort will be successful.

Either of the first two methods, when it can be adopted, is always certain to exterminate the ticks; but the third is not applicable to large herds, and will fail unless it is carefully and thoroughly carried out.

FORAGE CROPS FOR THE SOUTHERN FARM.

By C. C. Moore, Charlotte, N. C.

The question of forage on a Southern farm is easily solved. Almost every vegetable plant can be used for forage. There are, however, certain plants that will produce forage in abundance.

To have forage plentifully, every farmer should make the growing of it one of his crops. Each year a piece of land should be selected especially for this purpose. It is as important as corn, cotton, tobacco or grain crops, but it is nevertheless the most neglected crop.

At this season of the year the turnip crop should be considered, as it is of great value. We prepare our turnip land to a fine condition; manure heavily; plant in drills three feet apart; when the leaf is as large as a dime, thin to fifteen inches; cultivate often. We raise great quantities and find the crop profitable for winter feeding.

For the earliest spring feed we sow rye in August. Two bushels per acre on well-prepared land liberally manured usually produces feed by the 15th of March. Rye makes a fairly good hay if cut when in the "boot."

Crimson clover is the most valuable winter crop we plant. We find September and October the best months for seeding; and to be assured of a good, big crop we sow on a perfect seed bed, using lots of manure, and if the land is at all thin we drill in two hundred pounds of acid phosphate per acre; from fifteen to twenty pounds of seed are sown to each acre. The yield of hay from good preparation is about one and a half tons per acre. The corn crop planted on this clover stubble has never failed us. We have grown eighteen tons to the acre of silage corn after crimson clover.

For a great yield of hay we sow one bushel of wheat and fifteen pounds of crimson clover per acre. The crop is cut when the clover is in full bloom. It is quite easy to make two tons of hay per acre, and it is a milk and fat producing feed.

Hairy vetch and wheat is also fine for green feeding or hay. We are seeding more land each year to this mixture, and are convinced that it is a crop mixture all our farmers will like.

Another good mixture is wheat, oats, rye and barley. If this is sown in August on fairly good land it may be grazed all the dry days from November 1st to March 1st; then, if stock be kept off, a good lot of hay may be harvested in June.

Spring-sown oats, if cut when in bloom, makes a capital hay—more valuable as hay than if threshed for the grain.

There is hardly an end to the summer crops we can grow for making forage. Every farmer may select such as he likes. In our own case, for a green feed from July 1st to November 1st, we have not found any plant that produces more to the acre or that gives better results from feeding than molasses cane. Every animal we have on the farm is fed green sorghum from the time it is four feet high, about the first of July, on to frost; then what is left is cut and put into a silo for winter feed. Here is a specimen cut from a five-

acre field. The bunch was cut from one square foot of land. There are twenty tons of feed on every acre in the field. We have never had a death from animals eating sorghum. We feed sparingly at first, always after a full feed of dry forage. We have about fifteen acres planted to sorghum and will feed the entire crop to our farm stock.

Every farmer who keeps ten head of stock should build a silo. The cost is small. One to hold sixty or eighty tons may be built for forty or fifty dollars. For filling the silo, corn is king. Our corn crop for silage is planted on crimson clover stubble land, broken as deep as the top soil extends; two or three-horse plows are used. After plowing, the land is dragged; then harrowed three to six times to get it fine and warm. The rows are about forty inches wide; corn dropped about eight inches apart; cultivation is continued until the crop is too large to work. All cultivation is done with the Globe harrow; it is almost a perfect tool. The yield is seldom under eight tons and often up to eighteen tons per acre.

Corn silage is the dairyman's friend, and every ten-cow farmer should have silage all winter.

Millo maize, Kaffir corn, cat millet and teosinte have all been grown on our farm. Not finding either to be superior to corn or sorghum, either in yield or result from feeding, we have dropped them out and now depend with confidence on our reliable friends, corn and sorghum.

After the wheat and oat crop we always sow peas. Professor Massey, the great advocate of this forage plant, being present, it would be impudence for me to do more than to say the pea is all right.

Soy beans grow finely for us and make a big yield; but as we have never found a pleasant and satisfactory way to harvest the crop, we have dropped it also.

Mr. George W. Vanderbilt and Colonel Julian S. Carr grow alfalfa to perfection. I do not believe the success of this crop depends upon the efforts of rich men to make a success of it. I am determined to raise as good crops of this most valuable clover as Colonel Carr or Mr. Vanderbilt have ever had.

We have thrown away more money buying red clover seed than in any other way on our farm. We have not had a decent crop in eight years. Clover is so good to feed and so good to help land, we are loath to give it up. We continue to sow and hope the next seeding will reward us with a good crop for our never-failing faith.

A dairyman on a small farm carrying eighty to a hundred cows cannot expect to produce all the forage required for his stock, but the farmer who has five to twenty-five head of stock cannot afford to neglect the forage crop; it is more valuable than either cotton or tobacco. Do not neglect it.

CONDIMENTAL STOCK FOODS AND CONDITION POWDERS.

By Tait Butler.

The large amount of money expended by the stock owners of the State for patent stock foods and condition powders renders the fullest information concerning their composition and merits desirable.

If these compounds possess any value it must be as either food or medicine. At one time the manufacturers of many of them made strong claims as to their food value, as indicated by the names they bear—Globe Stock Food, Acme Stock Food, Iowa Stock Food, Pratt's Food, Standard Stock Food, International Stock Food, etc.; but the work of the chemist easily showed their approximate food value, and it accordingly became necessary for the manufacturers to modify their original claims. At present most of them vehemently disclaim any special merit for it as food, but base their claims for patronage on the value of the compounds as condiments and medicines. It was too easy for the chemist and feeders to determine their true food value, and it became necessary, in order to maintain their sale, to transfer them to the uncertain and intangible field of medicine. The mystery and popular ignorance concerning medical practice make it a much more secure field in which to exploit fictitious claims. As medicinal or condimental agents, it is claimed that these patent compounds prevent certain diseases, cure a large variety of others and enable the animal to digest more food and make better use of it.

Let us briefly consider these claims. The first step in this will be to ascertain just what these powders contain. Fortunately, the Experiment Stations have furnished this information in such a way as to preclude any probability of error. Massachusetts, Connecticut and North Carolina published bulletins on this subject so nearly at the same time as to make it certain that the work was done independently and without any knowledge of each other's results, and the close agreement of their findings gives additional assurance of their accuracy.

During the past year or two, International Stock Food has been extensively advertised and considerable of it sold in this State, while Pratt's Animal Regulator has also had a large and general sale. For this reason, let us select these two and give their composition as published in the bulletins above referred to.

According to the Connecticut Experiment Station, Bulletin No. 132, International Stock Food contains wheat feed, cayenne, salt, charcoal and some bitter drug; Massachusetts' Bulletin No. 71 says it contains wheat offal, pepper, salt, charcoal and some material rich in protein; and the December (1900) Bulletin of the North Carolina Department of Agriculture says it consists of wheat bran, red pepper, charcoal and linseed meal. It will be noticed that all agree that wheat in some form is the principal ingredient. Pepper and charcoal are also found by all three, while salt and a material rich in protein—linseed meal by North Carolina—are found by two and a bitter drug by

one. This is, indeed, a remarkable unanimity of results, when it is remembered that these "foods" are not by any means constant in their composition, it apparently being the custom of the manufacturers to fill up with any odd material that happens to be cheap and convenient.

Pratt's Animal Regulator, according to the Connecticut bulletin, contains corn meal, salt, charcoal, fenugreek and a bitter drug, while the Massachusetts bulletin says it contains corn meal, salt, fenugreek and a bitter drug. In both cases the bitter drug is thought to be gentian. The agreement is complete, hence almost certain to be accurate in all respects, except at the time the Massachusetts sample was made the manufacturer seems to have been out of charcoal, or perhaps it was just at that time so expensive that he could not afford to sell it at $500 per ton.

At this point the chemist steps in and says if these substances are made up almost entirely of wheat bran and corn meal they should analyze about the same. Accordingly, taking the chemical analysis as given by the stations above referred to, we find that the protein content of International Stock Food was as follows:

Massachusetts	16.97	per cent
Connecticut	14.31	"
North Carolina	15.06	"

When we remember that there is about 16 per cent of protein, which is its most important food constituent, in wheat bran, we see how closely International Stock Food resembles wheat bran in its feeding value. This, of course, is not remarkable, for it is simply wheat bran adulterated with a little charcoal, salt and pepper.

Again, if Pratt's Food is made up principally of corn meal, as we have stated, it should analyze about the same. Corn contains about 10.5 per cent of protein, while the analysis of Pratt's Food was as follows:

Massachusetts	10.13	per cent
Connecticut	9.69	"
North Carolina	9.75	"

Again we find the stock powder a little inferior in feeding value to corn meal because of the adulteration with salt and charcoal.

We are now in a position to judge of the accuracy of the claims made for these compounds. There are two ways of doing that. First, after the chemist and the microscopist have told us the ingredients they contain, the medical man may judge of their value or effect from his knowledge of medical science, and the value of these substances when used in medical practice. Judged on this basis, I give it as my professional opinion that corn meal, wheat bran, salt, pepper, charcoal, fenugreek, etc., possess no marked medicinal virtue for either the prevention or cure of disease; but if you do not care to accept my opinion I ask you to go to your family physician, in whom you have confidence, and ask him if these substances are of value as medicines, and I am willing to abide by his reply. Moreover, it is certainly a fact that an animal does not need medicine unless he is sick, while on the other hand if really sick he should be treated for the disease from which he is suffering and not by mixtures of this sort, regardless of the nature of the disease.

The second method of judging of the value of these condimental stock foods or condition powders is by actual trials or feeding tests. The manufacturers

lay great emphasis on the value of testimonials based on what they call actual tests by practical feeders. These tests by so-called practical feeders are usually no tests at all, but merely consist in feeding the mixture to unthrifty animals or to a number of fattening or dairy animals. It is needless to say that because an unthrifty animal improves when receiving these condiments along with other good foods and care, such is no evidence that the condiments are alone, or even principally, responsible for the improvement. An animal frequently—very frequently—recovers in spite of the treatment it receives.

But apart from these considerations, it may be stated that no trial is either practical or worthy the name of a test unless the food and the animal are both weighed, and unless another lot of animals of the same quality, age, size and condition, and kept and otherwise fed in the same manner, are compared with those receiving the condimental foods. Fortunately, several tests of this sort have been made, and, while made by what the manufacturers and others sneeringly term theoretical feeders, are the only real practical tests made of the feeding value of these patent foods. Two tests have been made at the Kansas Experiment Station with dairy cows and briefly reported as follows:

FIRST TEST.

On November 1, 1900, sixteen cows from the herd of the Kansas Agricultural College were divided into two lots as nearly equal as possible, on the basis of the yields of milk and butter fat for the month of October. One lot (cows fed Acme Food) had the advantage by 212 pounds of milk and 17.4 pounds of butter fat for the month. Both lots were fed on alfalfa hay, with a grain ration of equal parts of corn chop and bran. In addition to this feed, one lot received Acme Stock Food, fed according to directions. On December 1st oats took the place of bran in the grain ration of both lots. The results for the three months (92 days) under experiment are as follows:

Eight Cows receiving Acme Food.		*Eight Cows without Acme Food.*	
Milk produced, pounds	14,271	Milk produced, pounds	14,395
Test, per cent	4.39	Test, per cent	4.13
Butter fat produced, pounds	626.7	Butter fat produced, pounds	595.9
Cost per pound of fat, cents	14.6	Cost per pound of fat, cents	12.3

SECOND TEST.

Taking the record for the month of January as the basis, a herd of twenty cows was divided into two lots as nearly equal as possible, there being only a difference of 1.4 pounds of butter fat in the total yield for the month. All the cows received alfalfa hay for roughness and equal quantities of corn and cob meal and oats for the grain ration. One lot received the Globe Stock Food in addition. The results for two months (59 days) are as follows:

Ten Cows with Globe Food.		*Ten Cows without Globe Food.*	
Milk produced, pounds	12,784	Milk produced, pounds	12,896
Test, per cent	4.05	Test, per cent	3.96
Butter fat produced, pounds	518.1	Butter fat produced, pounds	511.3
Cost per pound of fat, cents	11.7	Cost per pound of fat, cents	11

The Iowa Experiment Station also made a test of the value of these condimental foods and several well-known concentrated feeding stuffs when added to a corn ration, for the fattening of steers.

There were ten lots of 22 steers each, selected so as to make them all as near equal as possible. Of the ten lots, three were fed patent stock foods. The lot showing the lowest net profit as the result of 94 days' feeding had received Standard Stock Food. The lot showing the second lowest net profit had received International Stock Food, and the lot showing the fourth lowest net profit had received Iowa Stock Food. In other words, of the seven lots receiving no condimental food, all of them gave a greater net profit than two out of three of those receiving it, and six out of the seven receiving no condimental food gave a greater net profit than all of those receiving it.

The question often arises, why is it, if these stock foods are all frauds, that so many honest and intelligent men think they have obtained good results from their use? The answer is not difficult. There is in every organism an inherent tendency to return to normal conditions, or, in other words, to get well if sick. Accordingly, many cases would get well if nothing was given them but good food and care, and it should be remembered that when a man gets to the point of buying condition powders for an animal he is ready to give him the better care and food, which alone would and does bring about the desired improvement in condition. The "stock food" gets the credit, although it does contain nothing but wheat bran, charcoal, pepper and salt.

In conclusion, let me say that I do not deny that corn meal, wheat bran, charcoal, pepper and salt are good for live stock. In fact, I think if some of our animals got more plain corn meal and wheat bran it would be better for them; but the question is, can you afford to buy these substances when sold under a patent name and pay from $100 to $500 per ton for them, while they may had under their good, old-fashioned names at from $20 to $25 per ton?

These stock powders are usually purchased for animals that are "run down" and out of condition. In short, for cases where good food and care are needed, but if you think you must have some sort of medicine for them, go to the drug store and purchase, say, nux vomica and sulphate of iron and give one drachm of each two or three times a day. They will not only cost less, but if a tonic is really needed, are much more likely to produce the desired effect.

FERTILIZER MATERIALS AND FERTILIZERS; MIXTURES FOR DIFFERENT CROPS.

By B. W. Kilgore.

The fertilizer bill of North Carolina this year will be between $6,000,000 and $7,000,000.

Fertilizers are used for the sake of the nitrogen (or ammonia), phosphoric acid and potash they contain. These three are more often deficient in soils than the other constituents necessary to the growth of plants and are the ones soonest exhausted in cropping. Nitrogen, phosphoric acid and potash are not more necessary than the other constituents of plants, but with the exception of these, and possibly of lime in some cases, there is an abundance of the mineral elements in all soils for the requirements of all crops.

Fertilizer materials and fertilizers, then, are bought and applied to the land because they contain these deficient or needed constituents and are valuable in proportion to their richness in nitrogen, phosphoric acid and potash.

Usually nitrogen is supplied by one class of materials, phosphoric acid by another, and potash by still another, and complete fertilizers containing nitrogen, phosphoric acid and potash are made by mixing one or more of each of these three classes of materials in such quantities as will give the amounts or per cents of nitrogen, phosphoric acid and potash desired in the mixtures.

It is desirable that the farmer, especially when he mixes any or all of his own fertilizer, should be familiar with the materials furnishing nitrogen, phosphoric acid and potash, and their richness in the constituents sought, together with their special fitness for certain crops and soils, if they possess advantages over each other.

NITROGEN—ITS FORMS AND THE MATERIALS SUPPLYING IT.

Nitrogen is what is known to chemists as an element. It is one of the simplest possible forms of matter. From nitrogen nothing but nitrogen can be obtained, no matter to what treatment it may be subjected. There are something more than seventy of these elementary substances, all different from each other, and which singly and united to each other form plants, animals, earth, air and water. Some of these elements are solid, as iron, gold, silver, etc.; some liquids, as mercury (quicksilver), and some gases. Nitrogen is a gas; it makes up about four-fifths of the air, and from our everyday experience with and in the air we know nitrogen is a substance free to move, and has weight, but is without color, odor or taste. It is thus seen that nitrogen is one of the most abundant of substances, and yet it is one of the three soonest exhausted in soils, and is one of the most costly constituents of fertilizers. Nitrogen, as it exists in the air, is not, according to the best evidence we have at present, plant food for such crops as corn, cotton, the small grains, grasses, etc. Before most of our agricultural crops can use nitrogen it must be gotten in combination with some other element or elements.

Why Peas Improve the Soil.—It is only the leguminous (pod-bearing) class of plants, such as peas, beans, the clovers, alfalfa, peanut, vetches, etc., that can use this free (elementary) nitrogen as it exists in the air in their growth. On their roots will be found nodules, warts or tubercles, and in these are large numbers of micro-organisms (minute forms of life, which can only be seen with the aid of the microscope) which have the power to put the free nitrogen of the air into such forms or combinations that the plants can use it. When the roots, leaves or stems, or all of these plants decay in or on the soil, the nitrogen which they collected, through the aid of the micro-organisms, from the air is left in such condition that other agricultural plants can use it, and in this is the explanation of the improving and enriching power of a pea or similar crop. The cowpea takes nitrogen from the air, which most plants cannot do, and adds it in the decay of its roots and tops to the supply of combined nitrogen in the soil, while corn, cotton, oats, the grasses, etc., have to depend on the nitrogen already in the soil, or that which is supplied in fertilizers or added in the leguminous crops. The importance of a full understanding of the foregoing fact and its meaning to improved agriculture cannot be too well understood.

We have thus discussed what is known as the free, uncombined or gaseous nitrogen of the air, the original and greatest of all sources of nitrogen. It can only be used at first hand by one class of agricultural plants. The farmer should get all he can of this valuable and costly fertilizer constituent through these plants.

Sulphate of Ammonia as a Source of Nitrogen.—For fertilizers nitrogen must be sought in materials which already have it in combination. Nitrogen in combination with another gas element—hydrogen—which is a constituent of water, forms what is known as ammonia, which is itself a gas. It is very soluble in water and the pungent odor of "spirits of hartshorn," or ammonia water, is due to this gas—ammonia. The odor about stables and especially manure piles is due mainly to ammonia gas passing off into the air to be brought down by dew or rain to fertilize some distant field. This gas—ammonia—has a great fondness for sulphuric acid, with which it unites with vigor, the resulting substance being a white solid, known and familiar to fertilizer dealers and users as sulphate of ammonia. The commercial sulphate of ammonia, as used in fertilizers, contains about twenty per cent of nitrogen, which is equal to about twenty-four per cent of ammonia. A ton of this contains 400 pounds of nitrogen, which is 80 pounds more than is found in a ton of nitrate of soda, the next richest source of nitrogen in fertilizers.

In this material the ammonia is held and prevented from escaping by the sulphuric acid. Sulphate of ammonia is easily soluble in water and distributes itself through the soil where the plant roots can get at it. From it plants can obtain the nitrogen necessary to their growth. It is, on account of the ease with which water dissolves it, one of the most available and quick-acting sources of nitrogen for plants, but is at the same time one of the most, if not the most, costly sources. It has the advantage of not being readily washed out of soils, as clay and humus (decayed vegetable matter) have the power of holding it. The supply is rather limited and it is obtained mainly as a waste product in the manufacture of gas from soft coal, in the production of coke from coal, in the distillation of bones for making bone black, etc.

In sulphate of ammonia the nitrogen is said to be in the form of ammonia.

Nitrate of Soda is a white solid, which is mined in the rainless districts of South America, especially in Chili and Peru. As found there it is mixed with other substances, but when purified and put on the market as commercial nitrate of soda for use as fertilizer, it contains fifteen and one-half to sixteen per cent of nitrogen, or 320 pounds in a ton. The remaining 1,680 pounds in the ton is made up of the elements sodium and oxygen, to which the nitrogen is united to form the nitrate of soda, and in addition forty to sixty pounds of impurities, mostly common salt.

Nitrate of soda dissolves in water with great ease and distributes itself through the soil where the plant roots can get at it. It is the form of nitrogen that plants like most and which they take up in the greatest abundance. It is also the quickest-acting form of nitrogen, its effect on growing plants being often seen in the increased vigor and greenness of plants in two or three days after the application is made. It may be of interest to state here that scientific workers have shown that nearly all the nitrogen of plants enters them as nitrate. For instance, when sulphate of ammonia is put in the soil the nitrogen in it is changed, by the aid of micro-organisms, from the ammonia form to the nitrate form, and the nitrogen of such materials as cotton-seed meal, when it decays, passes by the help of minute forms of life in the soil to nitrates, when it is taken up by the plant. This high availability (solubility) of nitrates, especially as applied in nitrate of soda, makes it costly and also renders it liable to loss by washing out of the soil. It is the form of nitrogen most easily lost in the drain waters of the soil, and humus and clay do not hold it as they do the ammonia of sulphate of ammonia. Plants are so fond of it, however, and take it up with such ease, that very little is ever lost when there is a growing crop on the soil. In this may be seen the advantage of green crops in the fall and winter, especially in wet, warm climates and on loose, sandy and loam soils.

The preceding has had reference to what is known as the nitrate form of nitrogen.

Organic materials containing nitrogen are of two classes: Vegetable products and animal products.

Cotton-seed Meal is one of the very best and most important of the vegetable organic products furnishing nitrogen; especially is this the case in the South. Good meal contains 7 per cent of nitrogen, or 140 pounds in the ton. Expressed in terms of ammonia there is in meal about 8.5 per cent, or 170 pounds of ammonia in a ton. There is also in it about three per cent of phosphoric acid, of which about 2.5 per cent is available to laboratory fertilizer methods, and about 2 per cent of potash, 1.5 per cent of which is soluble in water.

As stated under nitrate of soda, materials like cotton-seed meal, in the process of decay, have their nitrogen changed, by the aid of the bacteria of the soil, to nitrates, when it is in the condition best suited to the needs of plants. An organic material furnishing nitrogen, then, is valuable as a fertilizer in proportion to its content of nitrogen and the rapidity with which it decays in the soil, or rather the rate of decay will determine the quickness of its action as a fertilizer. With short-season, quick-growing crops, quickness of action is an important consideration, but with crops occupying the land during the greater portion of all of the growing season it is better to have a

fertilizer that will become available more slowly so as to feed the plant till maturity. Cotton-seed meal decays fairly rapidly, but will last for a considerable length of time and is not nearly so available as sulphate of ammonia and nitrate of soda.

Cotton Seed are used to some extent as fertilizer by farmers, but are never employed by fertilizer manufacturers in mixing fertilizers. They contain on an average 3.1 per cent of nitrogen, 1.3 per cent of phosphoric acid, and 1.2 per cent of potash, or in a ton there are 62 pounds of nitrogen, 26 pounds phosphoric acid, and 24 pounds of potash. Seed decay more slowly than meal and hence feed the plant through a longer period of time.

Castor Pomace, which is the refuse product from the extraction of castor oil from the castor bean, sometimes finds its way to the South as a fertilizer material. It contains about six per cent of nitrogen and decays rapidly in the soil.

Dried Blood is the richest in nitrogen of any of the animal products used for fertilizer. It is obtained from the slaughter-houses, where the blood of the animals killed is collected and dried. There are two grades of it—"red" or "high-grade" dried blood, which contains from twelve to fourteen per cent of nitrogen, or two hundred and forty to two hundred and eighty pounds to the ton, and "black" or "low-grade" dried blood, which contains six to twelve per cent of nitrogen, or one hundred and twenty to two hundred and forty pounds to the ton. The former of these, or red dried blood, is not only richer in nitrogen, but its nitrogen is more available, since the red blood decays or rots more rapidly than the black variety, which is harder and tougher on account of having been dried faster and at a higher temperature. Blood is the quickest-acting source of animal nitrogen, and in this respect is about the same as cotton-seed meal, being, if any difference, somewhat quicker than meal.

Tankage is the waste parts of animal bodies which cannot be made use of in any other way at the great slaughtering and packing establishments. These useless parts, for other purposes, are dried, usually in large tanks, and ground. Tankage is quite variable in composition on account of the varying amounts of the different parts of animals which find their way into the refuse pile. The better grade of it is known as "concentrated tankage" and contains ten to twelve per cent of nitrogen, or two hundred to two hundred and forty pounds to the ton, and also a small amount of phosphoric acid, not usually over two or three per cent. Low grade or crushed tankage contains a good deal of bone, which lowers the nitrogen content to from four to nine per cent, or to 180 pounds to the ton, and increases the phosphoric acid to from eight to fourteen per cent. The phosphoric acid in tankage is mostly insoluble, but is more available than that in raw phosphate rock and less so, considerably, than the phosphoric acid in acid phosphate.

Dried Fish Scrap and Ground Fish are the wastes, first, from the packing and canning establishments, in which case it is largely offal, skin and bones and very variable in composition; and second, the residue from the extraction of oil from fish. This latter product is fairly uniform in composition, and contains seven to nine per cent of nitrogen, or one hundred and forty to one hundred and eighty pounds to the ton, and in addition it has six to eight per cent of insoluble phosphoric acid. Fish scrap, when well ground, decays rapidly, and is a good source of nitrogen. Considerable quantities of it are sold in this State.

The preceding materials, cotton-seed meal, castor pomace, dried blood, tankage and fish scrap are the main ones which furnish nitrogen in what is called the organic form. Before the nitrogen which they contain can act as food for plants, the materials must rot and allow their nitrogen to be broken loose from its combinations in them and to take on the new form, by the aid of the bacteria of the soil, of nitrates. The rapidity, then, of the action of organic materials as fertilizers depends on their rate of decay.

Office of Nitrogen in Plant Growth.—While nitrogen is necessary to the full development of all parts of plants, its most marked office is directed to the production of stalks, stems and leaves rather than fruit or seeds, the effect of too great an amount of nitrogen in fertilizers being to cause plants to produce weed at the expense of seed. Plants of rich green color and good size are not in need of nitrogen, while small, pale, sickly ones are in want of it. Soils that grow large plants which bud, flower and fruit poorly have more nitrogen proportionately than mineral constituents, and need phosphoric acid or potash, or both, to aid the fruit or seed-producing function. Unfortunately soils of this kind are very few.

COMPOSITION OF MATERIALS SUPPLYING NITROGEN.

PARTS PER 100, OR PERCENTAGE.

	Nitrogen.	Equal to Ammonia.	Total Phosphoric Acid.	Potash.
Sulphate of ammonia	20	24.2	----------	----------
Nitrate of soda	15.5 to 16	18.7 to 19.4	----------	----------
Cotton-seed meal	7	8.5	3	2
Cotton seed	3.1	3.7	1.3	1.2
Castor pomace	6	7.5	1.2	1.2
Dried blood (high grade)	12 to 14	14.5 to 17	----------	----------
Dried blood (low grade)	6 to 12	7.3 to 14.5	3 to 5	----------
Tankage (concentrated)	10 to 12	12 to 14.5	1 to 2	----------
Tankage (containing bone)	4 to 9	5 to 11	8 to 14	----------
Fish scrap	7 to 9	8.5 to 11	6 to 8	----------

PHOSPHORIC ACID AND THE MATERIALS SUPPLYING IT.

Phosphoric acid, as spoken of in connection with fertilizers, is made up of the elements phosphorus and oxygen, the latter being a gas which is present in the air to the extent of about one-fifth of the volume of the air, nitrogen constituting the bulk of the remainder. The element phosphorus—the rest of phosphoric acid—is a soft, yellowish, wax-like solid, which will take fire on a hot day, and in burning unites itself to the oxygen of the air. It is thus seen that phosphorus could not be used in a free state as a fertilizer, and even after it has united itself to oxygen the new substance—phosphoric acid—which is formed is so fond of lime, iron and similar substances in the soil that the phosphoric acid unites vigorously with them and makes what is known as phosphates. Examples of the latter substances are phosphate of iron and phosphate of lime, the last named constituting the main portion of

bone and the various phosphate rocks. It is not, then, as phosphorus or phosphoric acid that this important constituent of fertilizers is supplied, but in the combinations indicated as above as phosphates.

Phosphate rock, which is mainly phosphate of lime, is mined in South Carolina, North Carolina (low grade), Florida, Tennessee and elsewhere. As taken from the mines this rock contains twenty-six to thirty-five per cent of phosphoric acid, which is equal to fifty-six to seventy-seven per cent of phosphate of lime—the remaining portion of the rock being made up of such impurities as sand, clay, limestone and water. As phosphate of lime is the main constituent of bone it is sometimes called bone phosphate. Phosphate of lime or phosphate rock, then, is the chief source of phosphoric acid in fertilizers.

Acid Phosphate.—In its raw or natural state the phosphate rock has three parts of lime united to the phosphoric acid (called by chemists tri-calcium phosphate). This is very insoluble in water and is not in a condition to be taken up readily by plants. In order to render it soluble in water and fit for plant food, the rock is finely ground and treated with sulphuric acid, which acts upon it in such a way as to take from the three-lime phosphate two parts of its lime, thus leaving only one part of lime united to the phosphoric acid. This one-lime phosphate is what is known as water-soluble phosphoric acid. On long standing some of this water-soluble phosphoric acid has a tendency to take lime from other substances in contact with it, and to become somewhat less soluble. This latter is known as reverted or gone-back phosphoric acid. This is thought to contain two parts of lime in combination with the phosphoric acid and is thus an intermediate product between water-soluble and the original rock. In this treatment some of the ground rock is not acted on by the sulphuric acid and is thus left in its original insoluble condition. This is called insoluble phosphoric acid.

Water-soluble phosphoric acid is considered somewhat more valuable than reverted, because it becomes better distributed in the soil as a consequence of its solubility in water.

Available Phosphoric Acid is made up of the water-soluble and reverted; it is the sum of these two; and the available and the insoluble make the total phosphoric acid—it includes all the phosphoric acid present.

As stated above, when the ground phosphate rock is treated with sulphuric acid the latter takes from the phosphate two of its three parts of lime. These two parts of lime and the sulphuric acid unite with each other to form what is known as gypsum or land plaster. Acid phosphate, then, is a mixture of the three forms of phosphoric acid or phosphates referred to above—water-soluble, reverted and insoluble, and gypsum or land plaster, and water, and the impurities in the original rock—which have been stated to be sand, clay and oxides of iron and alumina. Were it possible to use pure phosphoric acid in fertilizers (it could not be handled in this state for fertilizer purposes) it would be too costly to separate it from the impurities associated with it in acid phosphate, and nothing would be gained except in freight on the other substances. On this latter account a high grade acid phosphate is preferable to a low grade one, as a smaller weight of other materials not specially wanted is present to be freighted and handled. In making acid phosphate ground rock and sulphuric acid are mixed in about equal weights, and as a result the acid phosphate produced has only about one-half as much phosphoric acid as the rock from which it was made. South Carolina phosphate rock, containing twenty-six to twenty-eight per cent of phosphoric acid, will give acid phosphate with thirteen to fourteen per cent of phosphoric acid,

while the acid phosphates from Florida and Tennessee rocks, with thirty to thirty-eight per cent phosphoric acid, contain fifteen to nineteen per cent phosphoric acid.

Considerable space has been given to the consideration of phosphate rock and to the acid phosphate produced from it, because the latter is the chief source of the phosphoric acid in fertilizers. The forms of phosphoric acid—water-soluble, reverted and insoluble—have also been dwelt upon, as they have different values as plant food, but the same form is regarded as having the same value, whatever the original source may be. For instance, the water-soluble phosphoric acids from the various phosphate rocks, from bone, from bone-black, etc., are believed to be of equal value, regardless of the source of material.

Bone and Bone Meal.—These were among the early materials used as fertilizer and are still popular and important. "Raw bone," which is usually put on the market as bone meal, contains about twenty-two per cent of phosphoric acid, which is equal to 48 per cent of phosphate of lime, in which form it is largely present in bone; the remaining 52 per cent of the bone being made up of water, fat and nitrogenous matter in sufficient quantity for the bone to contain about four per cent of nitrogen (equal to nearly five per cent of ammonia) or 80 pounds in a ton.

Steamed Bone.—The greater portion of the bone put upon the market as "bone meal" has been previously steamed or boiled for the purpose of removing part of the fat and nitrogenous materials (glue and gelatine). Fat has no value as a fertilizer and glue and gelatin are worth more as commercial products than for supplying nitrogen in fertilizers. The value of the bone is reduced by this process in proportion to the amount of nitrogen-containing materials removed. Such bone ("steamed") contains from one and a quarter to two and a half per cent of nitrogen and twenty-five to thirty per cent of phosphoric acid. The removal of the fat and nitrogenous matter leaves a larger amount of phosphoric acid in the resulting bone, which can be ground finer than raw bone before steaming, as there is not so much fleshy matter present to hold the particles together.

A rather small and variable portion of the phosphoric acid of bone meal is available (soluble), but it becomes available as the bone decomposes—the rate of decay being largely influenced by the fineness of the particles. The availability of the nitrogen of bone will also depend on how fast it decomposes in the soil, the finer the state of division the quicker it will act. From this it will be concluded that bone meal is not a quick-acting fertilizer and is not desirable where a quick fertilizer is wanted, but is a good source of nitrogen and phosphoric acid for lawns, permanent grass lands and long-growing crops.

Dissolved Bone.—Bone meal is sometimes treated with sulphuric acid, when it is called dissolved bone. When real bone has been used for this purpose the product contains two to three per cent of nitrogen and twelve to fifteen per cent of available phosphoric acid. Frequently, however, ordinary acid phosphate made from phosphate rock is misnamed "dissolved bone." If the material does not contain nitrogen it may be concluded at once that it was made from phosphate rock and is nothing but an ordinary acid phosphate. Even if it is made from real bone, no more should be paid for the available phosphoric acid in it, as the available phosphoric acid in dissolved bone and acid phosphate are of equal value, but the nitrogen in dissolved bone should be valued in addition to the available phosphoric acid.

Old Bones, bleached and white by long exposure and which have lost all their nitrogen by the decay of the organic matter in them, are worth no more than raw phosphate rock.

Tankage, as stated under nitrogen, contains, in addition to nitrogen, variable amounts of phosphoric acid. There are five or six grades of this material on the market, having from seven to twenty per cent of phosphoric acid, which is equal to fifteen to forty per cent phosphate of lime. The phosphoric acid in tankage is derived from bone and the discussion of its value under bone meal is applicable here. It will be observed that a high nitrogen content in tankage, as with bone meal, means also a correspondingly low phosphoric acid percentage, and that when the nitrogen is low the phosphoric acid is high. It may also be well to state that a higher percentage of nitrogen in tankage and bones means a correspondingly large amount of nitrogenous organic matter to decompose, which has a tendency to make the phosphoric acid associated with it available.

Fish Scrap has already been stated to contain six to eight per cent of phosphoric acid in addition to its seven to nine per cent of nitrogen. This phosphoric acid is present in the bones of the fish mainly and has about the value of the phosphoric acid in bone meal of the same state of fineness. Fish residue from canneries and packing establishments, which is composed mainly of the offal, skin and bones, will have more phosphoric acid than ordinary fish scrap from oil establishments, but the latter will have the higher nitrogen content.

Loss of Phosphoric Acid from the Soil.—As this substance is not volatile there is no danger of its escaping into the air and passing off in this way. Clay and humus also fix and hold it in the soil to prevent it from being washed out in the drainage waters, and the power of soils to thus prevent the loss of phosphoric acid is proportional to their content of clay and humus (decayed organic matter). In loose, sandy soils water-soluble phosphoric acid may be carried beyond the reach of plant roots and even to the streams receiving the drainage waters.

Office of Phosphoric Acid in Plant Growth.—As with nitrogen, phosphoric acid is necessary to the full and best development of all parts of plants, but its special efforts are directed toward the production of seed and fruit—those parts which are necessary to the plant's reproducing itself.

COMPOSITION OF MATERIALS SUPPLYING PHOSPHORIC ACID.

PARTS IN 100, OR PERCENTAGE.

	Nitrogen.	Phosphoric Acid Available.	Phosphoric Acid Insoluble.	Phosphoric Acid Total.
South Carolina phosphate			26 to 28	26 to 28
Acid phosphate from above		12 to 14	1 to 2	13 to 16
Florida phosphate			28 to 35	28 to 35
Acid phosphate from above		14 to 17	1 to 3	15 to 20
Tennessee phosphate			30 to 35	30 to 35
Acid phosphate from above		15 to 17	1 to 3	15 to 20
Ground bone (bone meal)	2½ to 4½			20 to 25
Steamed bone	1¼ to 2½			25 to 30
Dissolved bone	2 to 3	12 to 14	2 to 3	14 to 17

POTASH AND THE MATERIALS SUPPLYING IT.

Potash, as spoken of in connection with fertilizers, is made up of the elements oxygen (one of the gases of the air) and potassium, which is a soft, white substance. It floats upon and acts on water so vigorously that fire is produced, the substance thus formed being that kind of concentrated lye that is used in making soft soap. Even potash (potassium and oxygen) is so active that it could not be handled and used as a fertilizer. It unites itself with great vigor to such acids as sulphuric, to form sulphate of potash—muriatic acid to form muriate of potash—and carbonic acid, to form carbonate of potash. These last three substances—sulphate of potash, muriate of potash and carbonate of potash—with the impurities accompanying them, are the main materials used for supplying potash to plants, either as potash alone or in mixed fertilizers. They are all readily soluble in water and are thus available for plant food.

The chief source of potash materials is the Stassfurt mines in Germany, where they occur in great abundance and variety. Those used for fertilizer purposes are:

Kainit is a crude product of the mines and contains, in addition to about 12.4 per cent of potash (248 pounds to the ton) about 35 per cent of common salt. The rest of it is made up mainly of magnesium sulphate and chloride. The potash in kainit is in the form of sulphate, but the large quantities of common salt and magnesium chloride it contains give it no advantage over the muriate of potash.

Muriate of Potash is a purified product of the potash mines and is one of the richest of the materials supplying potash. It contains about fifty per cent of potash (1,000 pounds to the ton), the other fifty per cent being mainly the element chlorine.

Kainit and muriate are not as good sources of potash for such crops as tobacco and Irish potatoes as sulphate, as the former injures the burning quality of tobacco, and they do not produce as nice a grade of potatoes as potash in the form of sulphate does. For ordinary farm crops, however, kainit and muriate act as well as the sulphate.

Sulphate of Potash contains forty-eight to fifty-one per cent of potash (about one thousand pounds to the ton) which is in the form of sulphate, and it possesses special advantages for such crops as tobacco, Irish potatoes and some others.

Sulphate of Potash Magnesia, also called "low grade" sulphate of potash, contains twenty-six to twenty-eight per cent of potash (about five hundred and forty pounds to the ton), the balance of it being mainly sulphate of magnesia and a small amount of common salt.

Tobacco Stems and other refuse products of the tobacco plant are to be had in considerable quantities in the tobacco-growing and manufacturing districts. They are quite variable in composition and contain from one to three per cent of nitrogen, three to eight per cent of potash and one-half to four per cent of insoluble phosphoric acid. Nearly all the potash in tobacco stems is soluble in water and is therefore readily available to plants. Tobacco stems are serviceable also in preventing or diminishing insect ravages and fungus diseases.

Wood Ashes are valuable chiefly for the potash they contain, which varies in unleached ashes from two to eight per cent, being more in the hard woods like oak and hickory and less in the soft woods as pine, etc. As the potash in ashes is very soluble in water, exposure to rain or to leaching soon results in the removal of the potash, so that leached ashes have but little value beyond the lime they contain. In addition to the potash, ashes contain thirty to forty per cent of lime, which has a beneficial physical effect on the soil. The potash in wood ashes is one of the most desirable forms and is suitable for all crops.

On account of the variation in composition and fertilizing value of tobacco stems and wood ashes, they should only be bought on guaranteed composition and confirmed by analysis.

Losses of Potash from the Soil.—All the forms of potash used in fertilizers are easily soluble in water, but clay and humus fix and hold potash, as they do the phosphoric acid, so that little or no potash is washed from soils containing any considerable amounts of humus and clay. In loose, sandy soils it may, however, be carried beyond the roots of plants or out of the soil in the drainage waters.

Office of Potash in Plant Growth.—While potash is necessary to the development of all parts of plants, it has special work to do in connection with the production of seed. Potash and phosphoric acid are specially important in promoting and increasing seed and fruit production and in this regard are the opposite of nitrogen, which exerts its energy specially in the production of stalk and stem.

COMPOSITION OF MATERIALS SUPPLYING POTASH.

PARTS PER 100, OR PERCENTAGE.

	Potash.	Nitrogen.	Insoluble Phosphoric Acid.
Muriate of potash	50		
Sulphate of potash (high grade)	50		
Sulphate of potash (low grade)	27		
Kainit	12.4		
Tobacco stems	3 to 8	1 to 3	½ to 4
Wood ashes (unleached)	2 to 8		1 to 2

MIXING FERTILIZERS.

The foregoing has had reference to the various materials which contain nitrogen, phosphoric acid and potash in such quantities as to fit them for use in mixing fertilizers. Fertilizers of the various brand names and composition that are put upon the market are made by mixing together one or more of the preceding materials supplying nitrogen and potash with acid phosphate. By varying the proportions of these a fertilizer of any composition desired, within reason, may be obtained. It is the object of fertilizer manufacturers to mix nitrogen, phosphoric acid and potash containing materials in such amounts as will give the best quantities of nitrogen, phosphoric acid and potash for the crops in the section in which they are doing business.

FERTILIZERS FOR CORN AND THE GRAINS, COTTON AND TOBACCO.

Having discussed the materials entering into fertilizers and what phosphoric acid, potash and nitrogen do in the growth of plants, application may now be made of these facts in preparing mixtures or formulas for different crops.

Plants may be classified according to their root system, feeding habits and plant food requirements. Corn, the grains, and grasses are similar in these particulars. A good formula for corn, therefore, will give good results also on wheat, oats, rye and the grasses. It is difficult or impossible to say just what is the best combination of fertilizer constituents for different crops on different soils, and in recommending mixtures we have to be guided by the results of field experiments in our own State on the kind of land on which the crop is to be grown, together with those which have been conducted in other States having similar soil and climatic conditions. The Department of Agriculture has conducted for the past four years field experiments with different crops in two types of sandy soil in the eastern part of the State. This season similar experiments were begun on a good type of red clay soil in the Piedmont section. The results which we have obtained for the sandy soils of the East have enabled us to suggest, with considerable confidence, fertilizers for crops grown on sandy soils, but we must await the results of tests in the Piedmont area before suggesting with confidence mixtures for that section of the State.

FERTILIZERS FOR CORN AND THE GRAINS.

With these statements in mind and on a basis of our own field work and that in other States, we suggest the following formulas as ones that will give good results for corn, the grains and grasses:

No. 1—

Acid Phosphate	850 pounds.
Cotton-seed Meal	950 pounds.
Kainit	200 pounds.
Total	2,000 pounds.

This mixture contains available phosphoric acid 7.1 per cent; potash 1.09 per cent, and nitrogen 3.3 per cent. An application of 100 to 300 pounds per acre will give good results.

No. 2—

Acid Phosphate	1,000 pounds.
Fish Scrap	750 pounds.
Kainit	250 pounds.
Total	2,000 pounds.

This is about the same grade as No. 1, and contains available phosphoric acid 7.0 per cent; potash 1.6 per cent, and nitrogen 3.10 per cent.

No. 3—

Acid Phosphate	1,000 pounds.
Fish Scrap	950 pounds.
Muriate of Potash	80 pounds.
Total	2,000 pounds.

This is a more concentrated mixture than No. 1 and No. 2. It contains available phosphoric acid 7.0 per cent; potash 2.0 per cent, and nitrogen 3.8 per cent.

No. 4—

Acid Phosphate	1,000 pounds.
Cotton-seed Meal	950 pounds.
Muriate of Potash	50 pounds.
Total	2,000 pounds.

This mixture is about the same in composition as No. 1, and contains available phosphoric acid 8.1 per cent; potash 1.9 per cent; nitrogen 3.3 per cent.

For these crops there is no special choice as regards the materials which supply phosphoric acid and potash, as a pound of available phosphoric acid and potash in any of the materials supplying them will be as valuable as from any other source. This is also generally true as regards the nitrogen-furnishing materials, though it is not desirable to use over about 50 pounds of cotton-seed meal in mixtures for the grains where the fertilizer is to be drilled with the grain, as it prevents germination and thus injures the stand of these crops.

Nitrate of Soda.—In ordinary seasons it generally pays to apply one-half of the nitrogen as nitrate of soda to corn as a top-dressing from the first to the 15th of June, and to grains about the time stems begin to form. If this is to be done the materials furnishing nitrogen in the foregoing formulas should be reduced accordingly. One pound of nitrate of soda contains as much as 2.2 pounds of cotton-seed meal, 2 pounds of fish scrap, or 1.2 pounds of dried blood.

Application of Fertilizer to Corn and the Grains.—Fertilizers for corn should be applied in the drill at or just before planting, except nitrate of soda, which should be distributed along the side of the row, dropped opposite the stalks, or drilled on a "bone" in the middle of the row and afterwards throw this "bone" out. The nitrate should go on when the plants seem in need of fertilizer, but not later than the latter part of June for the early planting of corn. The quantity of fertilizer for corn varies from 100 to 300 or more pounds per acre, but as the use of commercial fertilizers on corn does not show the effect or produce the results that it does on cotton, 300 pounds is considered, in most cases, a maximum quantity.

For wheat, oats and the grasses the fertilizer may be broadcasted or drilled with the seed, the latter being preferable with the grains; 250 to 400 pounds are good applications.

Fertilizers for Corn and the Grains, following Peas, etc.—The best and most profitable yields in our experimental work were where the corn followed velvet beans, peas and other leguminous crops. These crops, with acid phosphate and kainit, or some other potash salt, are the best previous treatment and fertilization for corn. Where light crops of peas have been grown in corn, or cut from the land and the stubble left, it would be safest to add some nitrogen in the fertilizer mixture. In cases of this kind it is suggested that the nitrogen-furnishing material in any of the preceding formulas be reduced one-half. Where corn is to follow good crops of velvet beans, peas or soja beans, especially where the entire crops have been left on the soil, no further application of nitrogen need be made, but it is advised that about 200 pounds per acre, in the drill, of a mixture of

200 pounds of Acid Phosphate,
100 pounds Kainit,

be used.

FERTILIZERS FOR COTTON.

On a basis of our own experimental work and that in other States, as suggested in the discussion on corn, the following formulas are suggested as ones that will give good results with cotton:

No. 1—

Acid Phosphate 14 per cent	1,000 pounds.
Cotton-seed Meal	750 pounds.
Kainit 12½ per cent	250 pounds.
Total	2,000 pounds.

This mixture will contain available phosphoric acid 7.8 per cent; potash 2.1 per cent, and nitrogen 2.6 per cent, which is equal to 3.15 per cent of ammonia. Two to six hundred pounds of this mixture applied in the drill will give good results.

No. 2—

Acid Phosphate 14 per cent	1,100 pounds.
Fish Scrap 8¼ per cent Nitrogen	550 pounds.
Kainit	350 pounds.
Total	2,000 pounds.

This is about the same in composition as No. 1, and contains available phosphoric acid 7.7 per cent; potash 2.2 per cent, and nitrogen 2.30 per cent.

No. 3—

Acid Phosphate	1,200 pounds.
Fish Scrap	700 pounds.
Muriate of Potash 50 per cent	100 pounds.
Total	2,000 pounds.

This is a higher grade than either No. 1 or No. 2, and application per acre should be smaller. It contains available phosphoric acid 8.4 per cent; potash 2.5 per cent, and nitrogen 2.9 per cent.

No. 4—

Acid Phosphate	1,100 pounds.
Cotton-seed Meal	825 pounds.
Muriate of Potash	75 pounds.
Total	2,000 pounds.

This is about the same grade as No. 3, and contains available phosphoric acid 8.7 per cent; potash 2.5 per cent, and nitrogen 2.9 per cent.

Provided the phosphoric acid is available, it does not matter what the material furnishing it is, and the same is true as regards the different potash salts, except where cotton is subject to rust. On these lands it has been found that kainit will decrease but not absolutely prevent rust. For this class of soil I would, therefore, strongly recommend that the potash be furnished in the form of kainit.

For nitrogen, or ammonia, cotton being a long-season crop, it is desirable that the materials be such as will decompose in the soil rather slowly and furnish the cotton plant food during the entire growing season. Any of the animal or vegetable products, as cotton-seed meal, dried blood, tankage, or fish scrap, are excellent. Nitrate of soda may be used in small quantity in the mixture, to give the cotton an early start, and a top-dressing may be applied, as was suggested in the case of corn, about the middle of June.

Application of Fertilizers to Cotton.—The fertilizer should be applied in the drill at or just before planting. The quantity of fertilizer used on cotton varies from 200 to 600 pounds, and sometimes even 800 to 1,000 pounds to the acre; 400 to 500 pounds is the more common quantity used where the most profitable results are obtained.

FERTILIZERS FOR TOBACCO.

The formula most commonly and largely used in the State on tobacco is the 8-3-3 goods, though large numbers of our farmers employ an 8-2-2 fertilizer. A study of the experiments in tobacco growing and a consideration of the experiences of good tobacco growers show that the amounts of ammonia and potash in these mixtures are not as large as are generally needed to give the best results on bright tobacco—the type generally grown in this State. The formulas below are ones that we have been suggesting in THE BULLETIN of the Department, and in our correspondence with farmers, considerable evidence having come to us showing that good results are obtained from their use:

No. 1—

Cotton-seed Meal	900 pounds.
Nitrate of Soda	100 pounds.
High-grade Sulphate of Potash	250 pounds.
Acid Phosphate 14 per cent	750 pounds.
Total, one ton	2,000 pounds.

This mixture will contain available phosphoric acid 6.3 per cent; potash 6.9 per cent, and ammonia 4.5 per cent.

No. 2—

High-grade Dried Blood	500 pounds.
Nitrate of Soda	125 pounds.
High-grade Sulphate of Potash	310 pounds.
Acid Phosphate	1,065 pounds.
Total, one ton	2,000 pounds.

This mixture will contain available phosphoric acid 7.4 per cent; potash 7.7 per cent, and ammonia 5.2 per cent.

No. 3—

Fish Scrap	725 pounds.
Nitrate of Soda	100 pounds.
High-grade Sulphate of Potash	300 pounds.
Acid Phosphate	875 pounds.
Total, one ton	2,000 pounds.

This mixture will contain available phosphoric acid 7.2 per cent; potash 7.5 per cent, and ammonia 4.6 per cent.

No. 4—

Dried Blood	500 pounds.
Nitrate of Soda	100 pounds.
High-grade Sulphate of Potash	400 pounds.
Acid Phosphate	1,000 pounds.
Total, one ton	2,000 pounds.

This mixture will contain available phosphoric acid 7 per cent; potash 10 per cent, and ammonia 5 per cent.

No. 5—

Cotton-seed Meal	700 pounds.
Nitrate of Soda	100 pounds.
High-grade Sulphate of Potash	300 pounds.
Acid Phosphate	900 pounds.
Total, one ton	2,000 pounds.

This mixture will contain available phosphoric acid 7.2 per cent; potash 7.7 per cent, and ammonia 3.8 per cent.

Four hundred to one thousand pounds of these mixtures should be used to the acre.

The mixtures made from formulas Nos. 2 and 3 are somewhat more concentrated than that from No. 1, on account of cotton-seed meal containing less ammonia than fish scrap and dried blood. The three formulas are given to enable the use of any one of the three main organic, nitrogenous materials—dried blood, fish scrap and cotton-seed meal. In the coast section fish scrap and meal are both easily obtained; some distance inland meal is more accessi-

ble, while in the more western end of the tobacco belt it will be found convenient to use dried blood. All three are good sources of ammonia for tobacco. The other materials—nitrate of soda, sulphate of potash and acid phosphate—are the same for all mixtures.

Occasional requests are made for formulas furnishing as much as 10 per cent of potash, and No. 4 has been arranged to meet needs of this nature. It is known that excellent tobacco, in quality and quantity, is grown by the use of fertilizers of this class, and some of our farmers greatly prefer them to others containing less potash. It takes considerable observation and experimentation to determine the best practice in matters of this kind.

A limited quantity of stable manure is very beneficial to tobacco and it succeeds well after peanuts. These materials add ammonia to the soil, and where heavy applications of fertilizers are to be made in connection with manure, and on peanut land, it would be well not to have so much ammonia in the fertilizer as is used in the ones employed on land not having other ammonia materials put on them. Formula No. 5 is designed to meet cases of this kind. A good many Eastern tobacco growers plant tobacco after peanuts, and some of them grow peas between the hills of tobacco, planting them with hoes and putting six to ten peas in a place the latter part of June or early in July. This improves the soil for after-crops, but tobacco grown after tobacco and peas is said not to be of good quality, though, as would be expected, the growth is very large.

Good results will come from the use of high-grade fertilizers, such as are suggested above, or similar ones, and we believe that when once tried there will be no inclination to go back to the lower grade ones now so largely used.

The potash for tobacco should always come from high-grade sulphate.

THE CULTURE OF VEGETABLE CROPS IN THE MARKET AND HOME GARDENS.

ESPECIALLY ADAPTED TO THE NEEDS OF NORTH CAROLINA CULTIVATORS.

By W. F. Massey, Horticulturist.

INTRODUCTION.

Before the introduction of commercial fertilizers, and the completion of railroads North and South, the market gardening or trucking business of the South could never have been developed. Forty years ago no one thought of growing vegetables for market away from the immediate vicinity of a large town, where a plentiful supply of stable manure could be always obtained. Even after the use of artificial fertilizers had become common among farmers, and their use had developed the cultivation of some of the varieties of vegetables, such as peas and potatoes, on cheaper lands away from the immediate neighborhood of the large cities, the gardeners in those places could not be brought to believe that as good results could be had from the use of fertilizers as with stable manures. And so until a very recent period the gardeners around the large cities thought that for their use stable manure was essential. But even these men have found out that the same results can be had more cheaply by the use of commercial fertilizers, in connection with a leguminous crop buried in the soil, to take the place of the organic matter in the stable manure.

The rapid growth of our cities long ago demonstrated that the little gardens on their outskirts could not produce the needed supply. As transportation facilities increased, the production of early vegetables naturally moved southward, and their production had already assumed quite respectable proportions around Norfolk before the war. The abolition of slavery made it possible to hire large numbers of laborers in the vicinity of the Southern coast towns, where the freed negroes congregated, and with an abundance of cheap labor, quick transportation, an abundance of fertilizing materials, and a favorable climate and soil, it is no wonder that the business of market gardening has made wonderful progress in the South, and particularly in the Southern Atlantic States. North Carolina has by no means lagged in the development, and our trucking interest has become one of the leading agricultural interests.

Many men have gone into the business of growing vegetables who have had no special training as market gardeners, and many of these have been successful with the crops they have grown, while others, failing to realize the great difference between gardening and farming, have failed to get paying crops, because they did not understand the business, and tried to garden an area too large for the capital employed on it. The late Peter Henderson laid down as a rule, in cultivating the high-priced garden lands around New York City, that a man, to be successful, must have cash capital, outside his land, of $300 per acre. This was, of course, for places where labor was expensive and

rent so high that every foot of land was in close crop, taking much hand labor.

While, of course, the Southern gardener, with his cheaper soil, cheaper labor, and more extensive use of horse power in his work, does not need to have as large a capital as this, it is nevertheless true that in market gardening, as in farming, our people are inclined to spread over too large an area for their capital. The trucker who starts with a cash capital of less than $100 for each acre he cultivates in vegetables will be taking a serious risk of failure. If his crops are as good as his neighbor's with means, his margin will be smaller if he buys on credit, and the failure of one of his crops will be a more serious matter to him. There is no kind of soil culture in which a man needs ready cash so much as in trucking, and none in which a skilled man can use so much money profitably. It is with the hope that we can aid some of our people in acquiring this skill that this bulletin has been prepared. The writer has had the advantage of a long and varied experience in all the departments of practical horticulture, and believes that he can make suggestions of value to those already engaged in market gardening, as well as to those who desire to engage in it.

SOILS FOR TRUCKING.

The coastal plain of North Carolina is naturally the best region for the cultivation of the market gardener's crops, aside from the earliness of its climate and the facilities for water transportation. A truck farm must of necessity be on land level, or nearly so, for ease of cultivation and retention of fertility. It needs, too, a mellow, sandy loam for the greater part of the crops, and one abounding in decomposed vegetable matter.

These conditions are found nowhere else in the State to the same extent as they are on the eastern coast. The light clay loam ridges, level, sandy flats, and black peaty bottoms, which are all found there, often all on the same farm, offer a variety of soil for the best success of different garden crops. The man who will start a market garden on steep clay uplands or on a cold clay flat would be simply inviting failure. There are, of course, limited areas of fine garden land in the upland section of the State, but for extensive market garden operations, the business, at least so far as early vegetables are concerned, must always be limited to the level, sandy plain of Eastern and Southeastern North Carolina. On this plain, too, the cowpea, on which the market gardener of the South must in a large measure rely for the humus to supplement his commercial fertilizers, grows to a perfection not known elsewhere.

But while the eastern coast is the natural locality for the gardener who seeks to supply the early Northern demand, there are other sections of the State which have adaptations for certain crops, for the growth of which the eastern section is to a great extent unfit. These are the fall and winter crops of cabbage, the main late summer crop of Irish potatoes, and the celery crop. For these the upper Piedmont and the mountain sections are especially adapted, though skilled gardeners will be able to produce them fairly well in the East.

PREPARATION OF LAND FOR TRUCKING.

There is no one point upon which our people more commonly err than in supposing that any piece of mellow land, suited to trucking, but not rich, can be made at once to produce a paying crop of vegetables of all kinds by the excessive use of fertilizers upon it. While such crops as the English peas

may be produced on such land, the man who would undertake to grow a crop of early cabbage on it would be pretty certain to fail to get a paying crop. No matter how good the soil is for the ordinary farm crops, it will not be in condition to give the best results in garden vegetables until after several years of good culture and heavy fertilization. And while the commercial fertilizers contain all the elements of plant food that stable manure has, and in better proportion, the vegetable matter in the manure not only has a good mechanical effect on the land, but it keeps up the formation of nitrates in the soil. The commercial fertilizers lack this, and the lack must be supplied if we keep up the productiveness of the land. Decomposed vegetable matter from the forest will do this, but this is an expensive thing to collect and haul.

The most rapid and economical way in which the vegetable matter can be gotten into the land is by the growth of some leguminous crop on the land. For this purpose there is no crop in this latitude equal to the Southern field or cowpea. This plant, in common with all the pea family, has the power of capturing the nitrogen from the air and fixing it into the soil for the succeeding crop. Its heavy growth above ground, the greater part of which, too, comes from the air, furnishes a larger amount of vegetable matter than would be gotten in the heaviest dressing of stable manure.

The field pea gives the Southern gardener a great advantage over those in a Northern climate, because it can be grown after his early crops are shipped, as a preparation for his winter ones, and he can thus do as much in the way of supplying his soil with organic matter and nitrogen in one season as the other man can do in two, and can at the same time raise a valuable forage crop, for as the soil becomes well stored with vegetable matter we do not think that it is advisable or economical to bury the whole growth. The growth of tops will be of more value for feeding stock, and by careful saving of the manure he can return to the soil nearly as much of manurial value in a much more available condition. The keeping of dairy cattle in connection with market gardening is thus made practicable and profitable. The manure thus made is also a great help in the saving of commercial fertilizers. On highly manured truck lands the growth of crab grass, which comes on naturally after the removal of crops late in the summer, is another valuable aid in the feeding of stock. Whenever there is a ready sale for dairy products it will always pay to keep cows for the consumption of the forage that can be grown so heavily on these lands, and to use the utmost care in the saving of all the manure.

MANURES AND FERTILIZERS.

While it is doubtless true that for most vegetable crops the manure of the stable and barnyard is the best possible, few gardeners, particularly the Southern truck gardeners, are so situated as to get all that they need, and in some places it commands a price that makes it a less economical manure than the commercial fertilizers. Then, too, there are some crops that are actually better grown with commercial fertilizers, as the Irish potato, for instance, with which the use of the manure of cattle is apt to encourage the growth of the fungus causing "scab." But, as suggested above, every truck grower should endeavor to make all the manure he can by the profitable feeding of stock.

When fertilizers are depended upon exclusively, the green manuring with the cowpea becomes of the utmost importance, and until the soil is well filled with humus, it will pay to plow them under. When a heavy growth of pea-vines is to be plowed under, they should always be allowed to get their full growth and die upon the land before plowing them down. They have then done all that they can for the soil, and in dying there is no loss of any appreciable fertilizing value, since they part with the water only. There is then, too, no risk of a dangerous fermentation, as when a heavy green growth is plowed under in hot weather.

In using the manure from the stable or barnyard, the truck gardener needs to have it piled and reduced to a fine condition by slow fermentation. Coarse and fresh manure that a farmer can use on a grass sod profitably will not do for him. Thorough decomposition is essential to get the mass in a state in which it will give up its plant food most readily. Piling and composting, while seldom profitable for the grain farmer, is of importance to the gardener. Those who are so situated as to be able to get the sweepings from paved streets can profitably use this material for composting with their stable manure, and the black mold from the forest can also be used to advantage. These materials should be put in thick layers with the manure in a broad flat-topped pile, which should be chopped down perpendicularly, and thoroughly mixed by turning several times before using. The object is to keep up a slow fermentation and to check injurious heating, thus getting the pile into the condition of a black moist mold, suited for use in the hill or broadcast, as occasion may dictate.

ARTIFICIAL FERTILIZERS.

Mixtures almost innumerable are now offered by the manufacturers of commercial fertilizers, each claiming special qualities and advantages for different crops. Some go to the extent of offering a special brand for each different vegetable crop. This is largely unnecessary, though some variations of the different elements of plant food are desirable for different crops. The potato crop for instance, demands more potash than the cabbage crop, and less nitrogen, and the same rule will apply to most garden crops, according to their growth below or above the ground. The three elements of plant food which plants get by means of their roots, and which are most apt to be deficient in cultivated soils, are nitrogen, potassium and phosphorus.

LIME AND ITS USES.

Lime is one of the essential elements of plant food which must be in the soil to enable any plant to grow. But for all the purposes of plant food many of our arable soils contain an almost inexhaustible supply. But lime has been found to have a value in the soil apart from its use by the plant as food direct. The chief of these uses, in a soil well stored with decomposing vegetable matter, is in promoting the growth of the nitric ferment organisms that change parts of this organic matter into nitrates, and thus make the nitrogen of organic matter available as food for plants. Lime also corrects injurious acidity in soils, aids in the breaking up of insoluble compounds of potash, thus rendering that base available to complete the work of the nitric ferments, and also has an important mechanical effect in the soil, making a

clay soil more mellow and a sandy one more compact. On lands cultivated in trucking crops and heavily fertilized, and with frequent green manure crops buried in it, an occasional liming has a very beneficial effect. This will be particularly noticeable in the cabbage crop. While shell marl will to some extent have the same action, the insoluble form of the lime, as it exists in the marl, renders its action less marked and immediate than that of freshly water-slaked lime.

LAND PLASTER OR GYPSUM (SULPHATE OF LIME).

The action of plaster on any given soil can only be learned by trial. On sandy soils near the coast it is seldom so beneficial in its action as upon the clay soils of the interior. We have seen very decided benefit, on some soils, from the use of plaster as a top dressing on the crop of early "snap" or string beans. It is also sometimes very efficient in promoting the growth of clover or peas. But as there are many soils on which plaster seems to have no effect whatever, nothing but experiment can determine its value on a given soil.

COMMERCIAL FERTILIZERS.

As we have stated, the three constituents of plant food that are most generally deficient in our old soils are nitrogen, potash and phosphoric acid. In ordinary farm crops it is practicable, by the use of the leguminous crops, like clover and peas, to get a sufficient amount of nitrogen from the air, but this, while a valuable help, will not supply it in sufficient amount for immediate use for the purpose of growing the early vegetable crops of the Southern market gardener. For many of his crops an artificial combination of nitrogen, in a readily available form, is of the greatest importance. In the absence, then, of a plentiful supply of well-rotted stable manure, he must resort to some commercial source of nitrogen. While the nitrogen in commercial nitrate of soda is in the most readily available form, it is evanescent, and in practice it is found better to mix with it some slowly available form, as in organic matters like fish scrap and cotton-seed meal, to keep up the supply through the season of growth. Cotton-seed meal also carries supplies of potash and phosphoric acid. The common source of this last is the phosphate rock of North and South Carolina and other States. This is changed into a soluble state by being dissolved in sulphuric acid, making what is commonly called "acid phosphate." This is probably the cheapest form in which phosphoric acid can be had in the South.

Potash exists in a very soluble form in hard-wood ashes, and the ashes of cotton-seed hulls are particularly rich in it. Where these last can be had they furnish the best possible source of potash. But as they can seldom be bought by the gardener in sufficient quantity, he is compelled to resort to some other combination. The great source of potash now is found in the various potash salts mined in Germany and imported here under the names of kainit, sylvinit, muriate and sulphate of potash. The crude form of the salts is seldom available for the use of the market gardener on account of the large proportion of common salt which they contain. This prevents the heavy application of the crude article, as we would thus get for most crops an injurious amount of the salt. The concentrated forms of the muriate or sulphate of potash are the forms in which gardeners use the potash salts, except for asparagus, on which the kainit does as well. For most garden crops the muriate of potash will usually be found the best.

MIXING COMMERCIAL FERTILIZERS.

There are innumerable brands of mixed fertilizers offered by the men who make a business of preparing these in different proportions for various crops. But oftentimes it will be found easier and more economical to mix the ingredients, which can be purchased for this purpose, bearing in mind that the more concentrated form in which one can get these, generally the cheaper he will get the essential constituents, potash, phosphoric acid, and ammonia (or nitrogen). Most manufacturers of fertilizers always give the percentage of nitrogen in a mixture as ammonia, as this custom has grown universal from early practices. Ammonia is a compound of nitrogen and hydrogen, which has the properties of an alkaline base, and unites with acids to form salts. Sulphate of ammonia and nitrate of soda are the two most concentrated forms in which we can get nitrogen, and they are valuable forms for the truck gardener's use. A highly concentrated form makes a great saving at times in freight and handling. The farmers of North Carolina are far more secure in buying the commercial fertilizers already prepared than are the farmers of many other States, owing to the strict inspection laws, which are rigidly enforced by the Agricultural Department, and the constant and accurate analyses that are made of every sample offered for sale in the State.

There are many advantages in mixing the constituents at home, as in that way particular ingredients can be used for special crops, or advantage be taken in using local supplies. The purity of these ingredients can be ascertained by analysis, and their proportion in the mixture can be altered to secure any desired percentage. When buying the ingredients they should always be purchased on a special guarantee. When mixing at home the materials should be as dry and fine as possible, and should some be lumpy, as in the case of the potash salts or nitrate of soda, the lumps should be mashed before attempting to mix. A clean floor should be used for the mixing, and the ingredients, weighed out in proper amounts, should be poured on top of each other in alternate layers. Two hands, with hoes, on opposite sides of the heap, can mix the layers rapidly, at a cost not to exceed fifty cents per ton. When mixing a small quantity a wagon body is very convenient to use. Where large quantities of fertilizers are used, and sufficient power can be had, it will pay the grower to provide the necessary machinery for mixing the ingredients.

ROTATION OF CROPS.

While there are some crops, like onions and Lima beans, that seem to do as well or better by being grown continuously on the same land year after year, the systematic rotation of crops is, as a rule, as important in the garden as on the farm. While no excretory process has been discovered in plant life, it is nevertheless true that, though kept supplied with all needed plant food, plants of some kinds will not continue to give the best results year after year on the same land. They seem averse to feeding on the refuse of their own growth that inevitably accumulates from the harvesting of a crop.

Then, too, the different crops require the elements of plant food in varying proportions. Some require large proportions of potash in comparison to the nitrogen than others, and we can make our fertilization more economical by a rotation, for the potash is not going to leave us, like the nitrogen does, and we

can take advantage of this to some extent in the following crop. Soils differ, too, in their capacity for retaining manures. Clay soils have a much greater power for absorbing and retaining plant food than sandy soils. Unless the sandy soil is immediately underlaid by a retentive clay subsoil, its lower absorptive power will cause it more rapidly to part with the plant food by leaching. It will be found, therefore, to be much more important to keep up a rapid and regular rotation on crops on sandy soils, which, from their nature, are better adapted to early vegetable crops than a clay soil. While the experiments at Rothamsted have shown that a crop like wheat may be continuously grown on a clay soil without deterioration, the fact has been well settled by experience that with most truck crops a change of soil is of vital importance. We very much doubt that in our climate there is any soil that would give the same results that were obtained in the moist climate of England.

Dr. A. Oemler of Georgia, in his valuable book, "Truck Farming in the South," gives the following points on a rotation of crops that we heartily approve:

"First. To have a crop which succeeds another as dissimilar in composition and the demands it makes upon the soil as possible. Second. Never to have plants of the same family succeed each other; for instance, melons should not follow cucumbers, tomatoes should not follow egg-plants or Irish potatoes, beans should not succeed peas, or *vice versa*. Third. Tuberous plants should not be allowed to follow plants of the same character. Fourth. Root should not succeed root crops, as turnips, beets, etc. Fifth. Deep or tap-root plants should not succeed others of similar growth. Sixth. To make the heaviest application of manure to such crops as require most, as cabbage, onions, etc., and to have other crops succeed these requiring less, as tomatoes, egg-plants, etc., so that the whole farm may be brought to the same degree of fertility."

As has been frequently noticed by practical gardeners, there is often as much need for a rotation of manures as of crops. A piece of land that has been continuously dressed with stable manure will be benefited by a change to commercial fertilizers, and *vice versa*.

SEEDS AND SEED SOWING.

There is no point in horticulture in which so great an improvement has been made in this country as in the quality of the seeds offered for sale to the gardener. The art of seed growing is better understood, and the requirements of our climate have been studied by practical men. The writer can well remember when dealers prided themselves on the fact that the seeds they offered were "English" seeds, not knowing that with many plants American-grown seeds are infinitely superior for our use. In the days of the old "Early York" cabbage we remember with how much of uncertainty the seed were sown, not knowing whether any of them would make a solid head. And not until the "Early Jersey Wakefield" cabbage was developed from the "English Wakefield," by continuous selection in our climate, did growers fully realize that for certainty of crop it was necessary that cabbage seed for American use must be grown in America.

The question of climate in its relation to production has been more closely studied of late years, and no well-informed gardener now supposes that all the seeds he needs can best be grown in one climate. The fact that many sorts of

garden seeds are better for the production of the earliest crops, when grown in a high latitude, lead to the notion that all seed produced in a northern latitude are necessarily superior to those grown in the South. There is no greater error in horticulture. There are many seeds that do not reach their best development as crop producers, in any given locality, when they are grown far north or south of the latitude where they are to be sown. While the market gardener can seldom afford to grow his own seed, there are many which he can generally produce to advantage, if unable to get them from a reliable grower in his own latitude and elevation, for elevation above the sea has the same effect on many crops as a high latitude. In this class should be placed such seed as those of Indian corn, egg-plants, tomatoes, Lima beans, okra, cucumbers, melons and a few others. It is also a well established fact that the late fall-grown crop of Irish potatoes produced in the South makes far better tubers for growing the early spring crop from than those produced in a northern latitude, a fact that is rapidly revolutionizing the practice of gardeners, not only in the South but in the North as well.

One of the chief reasons for the common failure to grow good crops of sweet corn for table use in the South has been the fact that our people so commonly get the Northern-grown seed for planting. Indian corn, more than most other plants, fails to do its best far south or north of the place where the seed is grown. Indian sweet corn, grown and carefully selected for seed in our latitude, will produce far better results here than any seed we can get from the North. Garden peas, snap beans and some other seed had always better be of Northern growth. The radish seed sold by our best seedsmen are produced in France, experience having proved that they can be better grown there than here. But there is one point in regard to seeds that is not sufficiently understood by our gardeners generally. This is what we may call "pedigree." Thoroughbred seeds are of as much importance to the gardener as thoroughbred horses are to the race course. It takes a long course of skilled culture to establish a race in plants that will, with certainty, reproduce itself. There is a constant tendency in all plants to revert to an original, and, generally, an inferior type. Hence the necessity for skill and care on the part of the seed grower. Experienced planters understand this so well that they are more concerned about the strain from which their seeds come than about the relative percentage of vitality even, though both are of importance. No class of business men are so minutely careful as our well-known seedsmen to guard the purity and vitality of the stock they offer. The sharp competition between them to get and keep the best strains of the various garden seeds, and to retain the trade that they could only have acquired by such care, is the best guaranty that the gardener can have. The dealer who gets and keeps the trade of a large number of market gardeners around him must of necessity sell a good article. Experienced gardeners will often be found buying a certain strain of a common vegetable from a certain stock, and from no other, though they may possess the same vitality, because they know the value of pedigree. All the little extra early garden peas, for instance, are the same kind of pea, though branded with various names by the dealers; but the stock of some are more sought for by market gardeners, because they have found them to be more carefully kept to the true type than some others, or better "rogued," as the term is; that is, the plants that show a tendency to revert to the inferior type are kept pulled out of the crop. The

stock from which our leading seedsmen get their seed are nowadays of such general purity that any one can usually get just what he wants if he deals with a man of reputation. In most things it costs a Southern market gardener too much to attempt to save seeds, but if he grows nothing else he should always grow his own seed potatoes, and, in fact, should usually grow a surplus, as there is always a demand for them at planting time.

DURATION OF VITALITY IN SEEDS.

There is a great difference in different plants in this respect. Some seeds quickly lose their vitality, while some retain the power to germinate for a very long time. Lettuce seeds are not usually ranked among those which retain their vitality many years, but when well kept they may be trusted for several years. Beet seed will retain their germinating power for at least ten years, under favorable conditions; cabbage, kale, radish, tomato, spinach, turnips, asparagus, broccoli, cauliflower, beans and peas, are all good for four years or more; while pumpkin, cucumber and melon seed will keep for ten years. Onion and leek seed are not to be relied upon after the second year, and their vitality is much weaker even the second. But it must be borne in mind that these figures refer to seeds that are kept under the most favorable conditions. In the moist climate of our Southern coast the duration of vitality will usually be found to be shorter, and no one could trust onion seed here after the lapse of a year in our climate. Melon and cucumber seeds are more fruitful when two or three years old than when perfectly fresh, but make a less vigorous growth of vine. In all other cases perfectly fresh seed should be preferred. In all cases get seeds from a seedsman of established reputation, and do not trust the seeds put out on commission at country stores.

TIME FOR SOWING.

All seeds usually sown in the open ground vary in their requirements for growth. The vital principle in seed requires three conditions to induce germination—moisture, a proper degree of heat and access of the oxygen of the air. They all have a minimum temperature at which they will start into growth, some at a much lower point than others. Onions and English peas will germinate at a temperature but little above the freezing point, while seed of corn, cucumbers and other tender plants will rot if exposed to moisture at such a temperature. It is evident, then, that care must be used in sowing seed at the time when the temperature is suitable to the nature of the plant. The practice of soaking seed in water to hasten germination is seldom advisable, for unless the soil is in exactly the proper state of warmth and moisture at sowing, more harm than good will be done. If, at the time of sowing, the soil is dry it is always better to compact it over the seed, either by tramping with the foot on a row after sowing (as Mr. Peter Henderson used to insist upon), or by rolling. But if the soil is moist either of these practices will do more harm than good.

As a rule, all garden seeds should be sown in drills and not broadcast. Exceptions to this will sometimes be found profitable, as I have found it profitable to sow an early crop of strap-leaf turnips broadcast, and at times to scatter seeds of radishes among other slow-growing crops. But the rule holds good that the best crops are to be looked for from sowing in rows, careful thinning and clean cultivation.

No market gardener should ever sow seed by hand. There are now several effective garden seed drills, and no one can afford to sow seed by hand. The depth at which seeds are sown is governed by the character of the soil, the time of the year, and the moisture present. In a general way it may be said that the size of the seed should govern the depth of planting, but there are exceptions even to this, for seed of the Lima bean, one of the largest seed sown, should be but barely stuck in the soil, eye down. The old rule is to cover the seed about three times its thickness with the fine mellow soil, but in many light soils this will hardly be sufficient for many things. Seeds need deeper covering in sandy than in heavy soils, and the soil over all seeds should be made as fine as possible.

QUANTITIES OF SEED PER ACRE.

Books on gardening give tables of quantities of seed necessary to sow per acre. These are usually only approximate and in most books the quantities named are excessive. But it is far better to err on that side than to use an insufficient amount. Some seeds germinate with very feeble shoots, and it is important to have the seeds thick, so that they may be able to force their way out of the soil. The quantity to be used will vary, of course, with the distance the rows or hills are apart. There are 43,560 square feet in an acre, and the number of hills can readily be ascertained by multiplying the number of feet the hills are apart each way to get the number of square feet for a hill, and divide the number of square feet in an acre by this to get the number of hills in an acre.

The following figures given by Mr. Peter Henderson will be found useful as a guide, but few growers ever use so large quantities: Beets, 5 to 6 lbs. per acre; snap beans, 2 bushels; cabbage, one ounce for 2,000 plants; cucumbers, in hills, 2 to 3 lbs.; kale, 2 to 3 lbs.; watermelons, 4 to 5 lbs.; onions, 5 to 6 lbs.; onions, for sets, 30 lbs.; onion sets, 6 to 12 bushels; peas, 2 bushels; potatoes, 10 to 12 bushels; radishes, 8 to 10 lbs.; spinach, 10 to 12 lbs.; tomatoes, one ounce for 1,000 plants; turnips, 1 to 2 lbs.

THE USE OF GLASS IN TRUCKING AND MARKET GARDENING.

There is no point in gardening in which our growers are so deficient as in the skillful use of glass. They are too much addicted to the use of substitutes, in the shape of plant cloth, under the impression that it is cheaper. I have had a wide experience in the use of glass, and have tested the so-called substitutes, and know that they are not only less effective than glass, but in the long run far more costly. It is hard to understand the tardiness of the Southern gardeners to appreciate the use of glass, since they are usually wide awake to any improvement. Some seem to imagine that glass is only useful in the more severe climate of the Northern and Middle States. But a little experience of the great advantages to be attained by a skilled use of glass would soon satisfy any progressive Southern gardener that glass can be made as profitable in all parts of the South as in the North.

COLD FRAMES AND HOTBEDS.

The most common use of glass in the garden is in the construction of cold frames and hotbeds. The difference between a cold frame and hotbed is that the cold frame is merely a frame to hold the glass sashes over a rich bed of

soil, for the protection of some plants in winter and for the hardening off of tender plants that have been started in a hotbed or greenhouse. The hotbed, on the other hand, is provided with some means of artificial heat, usually an excavation for holding a mass of fermenting manure, though sometimes a furnace is placed at one end and a flue run through a hot-air chamber under it, making what is known as a fire hotbed. This last is but a poor compromise for a greenhouse, which can be built nearly as cheap, and is vastly better. In fact, the small, narrow greenhouse has now almost superseded the hotbed of any kind for all the purposes for which a hotbed can be used, being much more convenient and effective.

To construct a cold frame we use glass sashes made for the purpose, three feet wide by six feet long, in which the glass is placed lapped like the shingles on a roof. These sashes can be had in Norfolk, without glass, at about $1.00 each, and if carefully handled and kept painted can be used for years, and in the long run will be found far cheaper than the plant cloth, and at the same time will be vastly better than cloth for all the purposes of the gardener.

For these sashes we construct a frame of boards. The one at the back or north side is 12 to 14 inches wide and the one in front 10 inches, so as to give a slope to the glass to carry off water in time of rain. The frame should face south or southeast. The frame may be as long as desired, but, for convenience, it is best, perhaps, to put not more than 25 sashes in one frame, though I have used 1,000 sashes in lines of fifty on a frame, with a cart road between each line of frames, always using, as will be explained later, twice the area of frames that I had of sashes. Some gardeners simply get the sides of the frames in line by nailing the board to a line of posts, and use no crossbars; but a frame so constructed, while convenient to spade up and prepare, is a very inconvenient one to manage. By far the best plan is to dovetail a strip, three inches wide, into the front and rear board every three feet of the length of the frame, but do not nail it fast. It can then be readily knocked out when preparing the soil in the frame. In the center of this rafter a strip of the same thickness as the sash should be nailed so as to form a slide for the sashes to slide up and down for airing the frames, it being, of course, understood that the sashes are laid across the frame the six-foot way. This will give us a bed nearly six feet wide and as long as convenient.

The frame-yard should be in a well-sheltered place, and if not naturally well sheltered, should have a high board fence or some other protection, not only as a protection from cold, but from high winds of any sort, for nothing is so provoking as to have a sash blow away in a windstorm. In windy localities, near the coast, I have found it necessary to run a narrow strip midway the entire length of the frames, under which the sashes could slide, to prevent their being blown away. To make a hotbed of the frame, all that is necessary is to dig out the interior into a pit two feet deep in which to place the fermenting manure. This manure should be fresh horse manure mixed with plenty of leaves or straw, and should be piled and turned daily for a week or more before using, and then be packed two feet deep in the pit and well trodden all over, so as to have a uniform heating, and should be covered with four inches of light, rich soil, in which the seeds are to be sown when the first rank heat is over. But the hotbed is an inconvenient, troublesome and expensive structure, in the long run, as compared with the cheap,

narrow, fire-heated greenhouses, which have now so largely taken its place with all progressive gardeners.

Plenty of sashes in cold frames are indispensable in a well-ordered market garden, both for growing some crops under for winter market, and for hardening off plants like tomatoes, egg-plants, etc., that have been started in the greenhouses; but for all purposes for which the hotbed can be used, the greenhouse is far better and more convenient, and in a series of years will be found cheaper. Of the management of frames and greenhouses we will treat when treating of the culture of the various crops that require their help.

HOW TO MAKE A CHEAP GREENHOUSE.

The most economical greenhouse for truckers is probably the low, narrow house recommended many years ago by the late Peter Henderson. This kind of a greenhouse is made with the same sashes that are used in the construction of the cold frames. The house is made by setting posts in line, four feet apart, to make the side walls. These side walls are four feet high and ten feet apart, this being the width of the house. The tops of the posts should be cut to the slope of the roof, and a plate nailed thereon, on which the sashes are to rest. This plate should project inside and out so as to allow of a gutter being formed on its outer edge, for it is desirable to have a tank inside to catch the rain water from the roof for watering purposes. The ridgepole for the roof should be cut so that the ends of the sashes which are to form the roof will rest on the shoulders and come flush with the top. Each alternate pair of sashes is screwed fast to the ridgepole at the top and to the plate at the side walls, thus forming rafters for the support of the ridgepole. The other pair are to be hinged to the plate at the bottom and held in place at the top by a hook, or by an iron strap punched with holes to catch on a pin on the ridgepole, so that they can be propped open to admit air to the house. If the house is to be heated by an ordinary brick flue it should not be more than 40 to 50 feet long. A door wide enough to admit a wheelbarrow should be at each end, and a walk through the center under the ridgepole. Benches are to be made on each side for holding soil or for placing flower pots or boxes. These benches and the whole house can be constructed of rough lumber, with the cracks battened. The house should run north and south, and at the north end a shed should be made for a work room, and into which the furnace door is to open, so as to keep the smoke and dust from the house. The furnace is made of brick, in a pit four feet below the level of the house. The furnace should have an ordinary cast-iron door and ash pit, and the grate surface should be 18 by 30 inches. An arch is turned over the fire box and the flue is built from the rear end on a sharp ascent to the level of the floor of the house. It should then be built along under the side benches, on a slight ascent, the whole length of the house, across the further end and back to the chimney at the same end it started from. The first ten or fifteen feet should always be made of brick, the remainder of six-inch terra-cotta pipe. The furnace should never be made smaller than this, so as to hold a good body of coal to keep up a slow and steady fire during the night without attention. The furnace may be made to burn wood, and in that case no grate-bars will be needed, as the fire can be entirely regulated by a draft hole in the door. But a coal-burning furnace is far better, where convenient. For seed-sowing purposes it is better to have the flue entirely boxed in under the

benches, but in this case hinged doors should be made along the walk, so as to let more heat out into the house when needed.

A house of this description can be built here now, all complete, 10 by 50 feet, for less than $200, and no market garden is complete without some such structure. Where a large business is done, and means are at hand, it will be better to build larger houses, in a more permanent manner, and have more than one, so that different temperatures can be maintained for the requirements of the different plants. In this case it will be best to heat the houses with a boiler and the circulation of hot water or steam in iron pipes. For large houses this will be more economical in the end than the smoke flue, but much more costly at the start. But the heat is much more congenial from hot-water pipes or steam than from a flue and is better distributed.

Northern gardeners use hot-water and steam-heated houses now on a very large scale for forcing vegetables and fruits under glass in winter, and their products bring a much higher price than the same products from the open air in the far South at the same time. Last spring cucumbers from the arctic climate of Vermont sold for more money than the same vegetable did from the open ground in Southern Louisiana. The Vermont growers are about as far off from the New York market as the North Carolina growers, and must use much more expensively built houses than our growers would have to use and vastly more fuel to keep up the same temperature. We are very strongly of the opinion that in this part of the South the methods used so profitably in the North now for the production of the various vegetable and fruit crops out of season could be adopted with far greater profit than there. But skill in greenhouse management, and particularly in winter-forcing, is only to be obtained by long experience, and no one can hope to succeed at it until they have attained this experience, or have the aid of trained men.

In our climate we can produce some things, like lettuce, for instance, in winter, by the aid of the simple cold frame, which the Northern gardeners grow much more expensively in fire-heated houses. Of this we will treat in the chapter on the crop. Our New Bern and other gardeners make it pay to ship lettuce from the open ground in spring, but they now make it much more profitable to ship in winter. The market as far south as Baltimore and Washington is largely supplied in winter with lettuce from the Boston greenhouses, which our growers can supply at a much better profit. I have dwelt thus largely upon the use of glass because, from an experience of more than thirty years in handling all sorts of glass structures for the cultivation of plants, I am satisfied that there is no line of work in horticulture which offers so great prospect of profit to the growers in the upper South. Profit is always greater in those lines that require special skill and capital, and, therefore, the work is rarely overdone. There are many things in the line of floriculture which a gardener of skill could add to his work and thus increase his profits and keep his houses always at work. The limits of this bulletin will not allow me to enter into the details of greenhouse management, but we hope to make this the subject of another of our educational bulletins at some future date. This bulletin is to be devoted to the methods of culture of various crops which engage the attention of market gardeners here. The insects that attack them might well be included, as well as the diseases that afflict them, but this would increase its bulk too largely. The Station has already issued bulletins on the subject, and to these I must refer.

VARIETIES OF VEGETABLES AND THEIR CULTURE.

It is the purpose of this bulletin to treat more fully of those garden vegetables which can be most profitably produced in the South for shipment to the Northern markets, but at the same time we will give attention to the needs of the home gardener and of those in the more elevated regions of the State who are building up a trade in late vegetables for the coast country of the lower South. Therefore, we propose to make this bulletin far more general in its teachings than the former editions of our bulletin entitled "Trucking in the South," which were mainly intended for the use of the market gardeners in the warmer sections of the State. The supply of the home markets of the State is becoming annually of more importance, with the great increase of cotton mills, with their villages of employees, which are to be fed from the farms around. Hence we will endeavor to make the directions for cultivation suited to the various sections. The various vegetable products will be treated in alphabetical order.

ARTICHOKE.

The plant commonly known here as artichoke is a species of sunflower (*Helianthus tuberosus*), or Jerusalem artichoke. It produces tubers on the roots somewhat similar to the Irish potato in appearance, and is seldom grown as a garden vegetable, though at times used for the making of pickles. Of late years there has been a great deal of interest in this plant as a food for hogs, and it is being largely grown for this purpose in some sections. The true or French artichoke is a very different plant from the Jerusalem artichoke. It produces no tubers on the roots, but is grown for the large, fleshy involucre around the flower heads. The plant varies greatly when grown from seed, and it is a common practice now to propagate the valuable varieties from division of the plant. Of course any superior sort produced from seeds may be increased in this way. The Globe or French artichoke is perfectly hardy in any part of the State, and it is rather surprising that the plant has not been grown here to any extent. The plants should be set in deep, moist and rich soil, about three feet apart. In the colder sections of the State it may be best to cover the roots in the winter with forest leaves as a protection to the crowns, but in the warmer parts of the State no protection will be needed. The plants will produce good crowns for four years or more, and then should be divided and reset. The Large Green is about the best variety. The botanical name of the plant is *Cynara scolymus;* the name *Cynara* is said to be derived from *cinere*, ashes, since the old Romans thought that ashes were a special manure for artichokes. The undeveloped flower heads are the part eaten, and they are similar in appearance to a very small pineapple, and the thick scales are the parts eaten. These heads sell well in the larger cities where there is a large foreign population who have become accustomed to the use of the plant at home. To grow the plant from seeds the seed should be sown in early spring, in rich soil, and transplanted when of proper size to their permanent quarters, or if properly thinned, the plants may remain in the seed bed till fall, and then be transplanted with more certainty. In the fall give the plantation a heavy dressing of manure after cutting the old stems away. The heads are sometimes pickled, but are generally used as a salad, with the usual salad dressing of oil, salt and pepper.

ASPARAGUS.

Asparagus is one of the oldest of cultivated garden plants, having been largely cultivated by the ancient Greeks and Romans, and it is still one of the most popular and profitable vegetables grown for the market. In the warmer sections of the State asparagus is largely grown for shipping to the Northern markets, and is uniformly profitable. The local markets throughout the State are but poorly supplied with this vegetable so far as we have observed, and its culture may be made a source of profit, even where it cannot be produced early enough to compete with the coast region in the Northern markets. Asparagus is found growing wild on all the seacoast of Europe, and it has become naturalized on the shores of the Chesapeake Bay, where it is found everywhere along high water mark. The fact that asparagus is found growing wild along the salt water has probably led to the notion that salt is a special manure for it. The fact probably is that asparagus can endure more salt than most plants, and a dose of salt that will kill the weeds among it will not hurt the asparagus. To this extent salt may be useful. But that it helps the asparagus as a manure is more than doubtful.

The catalogues give a number of varieties, but there is really very little difference in them except in the color of the shoots. Recently there has been introduce a variety which makes snow-white shoots and is slow in turning green. This is called the Columbian asparagus, and is desirable where a white asparagus is wanted.

There is no plant grown the quality and perfection of which depend so much on the richness of the soil as asparagus. Seed gathered from the wild asparagus along the shores, which seldom makes shoots stouter than a goose-quill, can be made in rich soil to produce shoots as large and fine as any of the so-called varieties, and any variety can be made fine by liberal feeding. Methods of culture will vary with the demands of the market to be supplied. In most cities the demand is for the bleached article produced by planting the roots very deeply and cutting them under ground. But in some markets the people are finding out that these white shoots are always tough, and are now seeking the more tender green shoots cut above ground. The new Columbian asparagus, which is white above ground, may soon take a prominent place in the markets. There is a great disadvantage in the South in the deep planting and cutting under ground, as the shoots are later in appearing in the spring. With the roots near the surface, where the sun warms them early, a much earlier cutting may be had, and as the earliest asparagus commands the best price, it will be well to consider the different modes of producing the crop.

The general advice is to plant two-year-old roots in deep trenches, in heavily manured land, and the statement is general that no cutting should be made till the third year. All of which is needless. We have cut fine asparagus the second spring from the sowing of the seed, and for the best and most profitable results we would sow the seed right in the rows where we expect to grow the crop, thinning and transplanting the plants when the size of a knitting needle, which can be done as easily as with any other garden plants.

For the best results with asparagus the soil should be of a light, sandy or mellow nature, and the first preparation must be of the most thorough character, for the crop is to last many years. The more manure you stuff into the

ground the better asparagus you will get and the sooner you will get it. Deep plowing, heavy manuring and good preparation are all essential to the formation of a productive asparagus plantation. Of course, where the ordinary bleached stems are wanted, the plants must be set in trenches. But this need not interfere with the transplanting of the young seedlings, instead of waiting one or two years for the roots and getting poorer results. The trenches may be prepared and well manured, and the plants may be grown in a seed bed like cabbage plants and set in the trenches as soon as large enough to handle. Then, as they grow, the earth can be gradually drawn to them so that by autumn the land will be level and the roots where you want them, and in far better shape than if let remain in the plant bed and then torn up after the roots get large. Young plants from seed sown in February, in the warmer parts of the State, or in March and April in colder sections, can in this way be grown so that a very fair cutting or two can be made the next spring, which would be entirely out of the question if the roots were set in the fall, after growing in the seed bed all summer. But the earliest asparagus will be produced when the roots are set on or near the level surface. A few rows will produce plants enough to set a large area when thinned, as they should be, to two feet in the row, the rows being four feet apart. Almost every writer on gardening says that the roots should remain in the seed bed till they are two years old before setting in the permanent bed. I had rather have seed to start with than two-year-old roots, and can get good asparagus more quickly from the seed than from the two-year roots, if the proper treatment is given. There has been a great deal of nonsense printed in regard to the cultivation of asparagus, and people have been taught that it is a very costly plant to grow, for, in private gardens, years ago, I have known people to dig out the asparagus bed two feet or more deep, and pave the bottom with bricks, as they had been told this was necessary to keep the roots from running into the subsoil, when in fact their tendency is to increase upward. The deep trenching of the ground and the heavy manuring were all right, and can well be done on a small garden plot. But the deep planting is wholly needless, and worse than needless, for when grown for family use we always want the tender, green tips, and not the tough under-ground white parts. In the preparation of an asparagus plantation, whether for home or market, we would prepare the soil as deeply and thoroughly as possible, and apply as heavy a dressing of manure as practicable, and if manure is not available, would use not less than half a ton per acre of a high-grade commercial fertilizer, strong in nitrogen. I would select the warmest and lightest soil at hand, since earliness is a prime object. I would sow the seeds as early as the ground could be prepared in spring, in rows four feet apart, and would scatter the seed thinly in shallow trenches and cover about one to two inches deep. Only a portion of the ground need be sown, as we have remarked that in thinning there will be plants for a great deal more land. Thin to two feet, and set the young plants thinned out in other rows at the same distance. As soon as the plants start to grow again mulch between the rows with fine stable manure, if possible, and cultivate shallowly during the summer, so as to keep this manure near the surface to preserve the moisture. In the fall cut off the dead tops and give the plot a dressing of kainit at a rate of 500 pounds per acre. This will give all the salt any one would apply and will furnish potash at a season when the kainit will not interfere with the

earliness of the crop, as it will if applied in spring. In the spring give a heavy coat of stable manure or half a ton of complete fertilizer. Under these conditions and with this treatment very good shoots can be cut the next season after the sowing of the seed, and the roots, being near the surface, will shoot earlier. This is just what we have done, and what any one can do, and the waiting three years for asparagus is simply because people have not learned that they can get it much sooner.

As we have said, this same method can be adapted to the trench system by having the trenches prepared and heavily manured so that the plants can be set in them as thinned. In either method we have learned the uselessness of waiting a year or two to get roots for setting. Those who do not care to go to the trouble of growing the plants from seed can buy the one-year-old roots in the fall from nurserymen.

In the private garden it will pay well to go to extra pains and expense in the preparation of the soil for an asparagus bed, particularly where the soil is heavy clay loam. A bed of very moderate size will supply a large family with this vegetable, if well grown. A bed six feet wide and fifty feet long will suffice for most families. If the soil is heavy and the subsoil clay, I would dig this bed out two feet deep and replace the natural soil with a compost prepared beforehand of black earth from the woods, stable manure and sand. Make the compost heap in the fall and turn it repeatedly during the winter to get it fine and well mixed, and fill the place of the soil removed with this compost. Now sow the seed and thin after a stand is secured to two feet apart each way. With a bed of this size it will be easy to set boards on edge around it and cover it with cheese cloth, like a tobacco plant bed, or even to set frames and glass sashes on it and thus get the shoots extra early.

When our market gardeners fully realize the value of glass in the forwarding of their crops, we will find them planting asparagus closely in beds that can be covered with sashes. The price that good asparagus commands in February and March will pay for a great deal of extra expense in getting the early crop. With intensive work on small areas we can often make greater profits than from large areas treated in the usual manner. Our natural climate gives us an advantage over those north of us, but it takes skill and glass to enable us to compete with those south of us, and this is what the North Carolina trucker should learn to do.

If one-year roots are used in setting an asparagus plantation, and it is desired to cut the shoots under ground, the roots must be set in deep trenches, but must not be covered deeply all at once, for the slender shoots will not penetrate a very heavy cover. Cover very lightly till the growth begins and then gradually earth up till level. But if the plan of growing from seed where the crop is produced is once tried, it will always be used. There are several so-called varieties of asparagus. Conover's Colossal has been very popular, but is now second in popularity to the variety known as the Palmetto. The Columbian is of more recent introduction, and is distinct from the others in making white shoots above ground, and very slowly turning green. Any variety may be made colossal by liberal manuring.

In the local markets we often see asparagus offered for sale of a very inferior character—small, short shoots, tied in little bunches of various sizes, such as could not be sold at all in the markets of the large cities. Market growers should always use the regular bunching machines, which enable the

grower to have his bunches of uniform size, and these should be properly tied with two ties of raffia fibre, and not with strips of old rags, as we have seen. To succeed in market gardening one must learn market methods in the putting up of vegetables for sale, and must produce that which his market wants.

BEANS.

Under the general name of beans we have a number of plants belonging to a variety of botanical genera, and differing greatly in their appearance and quality. The bean of the English gardens, *Vicia Faba*, or broad bean, is little cultivated in this country. The bean of most interest to our Southern market growers is what we generally know as the snap or string bean, which is very largely grown for shipping green. The Lima beans are being more largely grown for shipping in the dry state.

ENGLISH BROAD BEANS.

These have been but little grown in this country. Being a bean, people generally look upon them as tender, and hence plant them in late spring, and out hot suns soon kill them. In the warmer parts of the State, east of the mountains, these beans can be planted in November or December and will then come into use green along with the green peas in May. In the mountain country they should not be planted till February. They do not mind pretty hard freezing. In fact, I have had them frozen stiff when in bloom without being hurt. The best varieties are Broad Windsor and Mazagan. They are not worth growing for market in this country, but make a pleasant variety for the family table, if cooked when green.

SNAP OR STRING BEANS.

These are among the most important of the early crops grown by the truckers of Eastern North Carolina for Northern shipment. Snaps need the warmest and lightest soils and the most sheltered exposure. As the crop is sold green and early growth is important, they should have a fairly liberal fertilization, though not near so heavy as some other market crops. About 400 pounds per acre in the furrow, under the rows, will suffice of a complete fertilizer. The catalogues list a great many varieties, but the Southern trucker sticks closely to a few sorts that pay him best. The crop is planted in rows, about three feet apart and the beans are dropped moderately thick in the rows and cultivated several times. The flea beetle is sometimes very troublesome by eating the leaves full of holes. The best preventive is dusting the plants over freely with tobacco dust, which will also help the plants as a fertilizer. The disease known as *anthracnose* is at times troublesome, especially on the yellow-podded or wax beans. The only preventive is to use beans for seed that have come from a healthy stock, and to spray freely with Bordeaux mixture.

Varieties.

Early Mohawk.—This variety is largely grown by our market gardeners because of its hardy nature, enabling it to withstand a slight frost. It is a good cropper and early.

Early Valentine is probably the best early bean. It has round pods and is very productive, and continues stringless longer than most varieties. It follows the Mohawk and sells better by reason of better quality.

Dutch Caseknife.—This is a flat-podded bean, good as a snap bean, and good also as a dried bean, and is common in the South under the name of "cornfield snap," because it is frequently planted with corn and allowed to run on the stalks. It is not worth planting for shipment, but is good for home use, and can be grown in any quantity in the cornfield.

Black Seeded Wax.—This is the most commonly planted of the yellow-podded or wax beans, though peculiarly liable to rust and *anthracnose*.

Brown Speckled Wax.—This is far better in quality than the black seeded, and should be planted in the home garden where a wax bean is wanted.

White Seeded Wax.—This is a pretty bean, with pure white seed, like a Navy bean. We have grown it this year for the first time and consider it a very promising variety, as the beans are useful both as a snap and as dry beans to take the place of the Navy bean.

LIMA BEANS.

There are two general classes of Lima beans, the small and the large Lima. The small Lima, or Seewee bean, is more commonly planted in the South than the large Lima, which is generally unproductive in the South.

There are a number of varieties of each class. Of the large Lima we have the following

Varieties.

Large White Lima.—Of this variety the seedsmen have made a number of specially selected sorts, each bearing a special name. There is really very little difference between them. All are rank climbers and need tall poles. They should be planted around the poles, which are set, when the ground is prepared, four feet apart each way. The large beans are barely stuck in the ground around the pole, with the eye down, for if covered deeply there will be difficulty in their getting up. We plant four beans to a pole and thin to two. The same remarks will apply to all the pole Limas.

Dreer's Lima or Potato Bean.—This is a thick-seeded sort, as its name would indicate. It is smaller when dry than the regular large Lima, but very large when green, and it is far more productive in the South than the large flat Lima. Of the Seewee or small Lima class we have the following among the climbers:

Small Lima, or Butter Bean, as it is commonly called here. This is the most productive of the pole Lima beans. It is much smaller than the large Lima, but of far better quality, in our opinion.

Willow Leaf.—This is a variety of the butter bean, distinguished mainly by its narrow, willow-like leaf. In other respects it is very similar to the small Lima.

Speckled Lima.—This is another small Lima, the distinguishing feature of which is its purple spotted leaf. It cooks so dark as to be rather uninviting and is in no respect better than the common butter bean.

BUSH LIMA BEANS.

A number of dwarf-growing varieties of the Lima bean have been produced of late years, which can be grown in rows like the snap beans. The first of these was:

Henderson's Bush Lima.—This is a variety of the Seewee or butter bean, which made its appearance in Campbell County, Virginia, about fifteen years ago and got into the hands of a Virginia seedsman, who sold the stock to the late Peter Henderson, who introduced it to the trade. It is earlier than the pole Limas of any sort, and is a very productive and good bean.

Wood's Bush Lima.—This seems to be a selection from the Henderson, of rather larger size seed, and wonderfully productive. I regard it as about the best of the bush Limas.

Burpee's Bush Lima.—This is a dwarf variety of the large flat Lima, and with us has the same defect as the pole Lima, in being unproductive. The beans are as large as the large Lima and are of fine quality.

Dreer's Bush Lima.—This is a dwarf variety of the potato or thick-seeded Lima, and is an excellent sort. A subvariety has been introduced under the name of

Dreer's Wonder Bush Lima.—This is claimed to be the earliest of all the bush Lima beans, but, as I am growing it this season for the first time, I cannot say what it will turn out yet. The plants are very promising. Later.—A first-class bean.

Lima beans differ from other legumes in the fact that they make no nodules with bacteria on the roots, which enable other legumes to get nitrogen from the air. Hence they need heavy manuring, and thrive only when liberally treated with food. Like onions, they can be grown with better results if kept on the same land year after year, if the soil is heavily enriched. It is useless to try to grow Lima beans on poor soil. On well-enriched land the bush Lima can be made a very profitable crop in the South for the dry beans. They sell for better prices than the Navy beans and are better suited to our climate than these. All the beans, except the English Broad beans, are tender and should not be planted till the soil is warm and frost over. Truckers commonly take some risk in this matter so as to be among the earliest, and hence the common use of the Mohawk bean for the snap market, as it stands more cold than any other variety. The small Limas, like Henderson's and Wood's, are rather more hardy than the large Lima, and can be planted earlier with safety. All the Limas, however, should have the seeds merely stuck in the ground, eye down, for the best germination.

NAVY BEANS.

A great many people, seeing the Navy beans at the stores and noting that they bring good prices, write asking for methods of culture. We always advise our people to go very slowly in growing Navy beans in the South. They are far better suited to the climate of the Northern States, where the summer rainfall is not so heavy. Grown here, the percentage of damaged beans will make them a very expensive crop to clean for market, and there is little chance for their being profitable here.

BEETS.

Some writers suppose that because the beet is a native of the seashore in the south of Europe that salt is a valuable manure for it. The plant may be able to use some soda, since analysis shows that it contains soda, but it can be as easily and well grown without it as with it. It needs a deep soil for its taproot, and a mellow one, easily penetrated, especially with the late and

long-rooted varieties. A good application of a complete fertilizer, high in nitrogen and potash, should be used in the furrow. Two furrows lapped over this to form a slight ridge, which is to be rolled nearly flat, and you are ready for planting. It is hard to get any of the garden drills to sow beet seed regularly, and one of the best contrivances I have ever seen for the purpose is a light wooden wheel with rounded pegs an inch long around its circumference, three inches apart. These pegs make small hollows in the smooth ground, and a seed is dropped in each and covered. This seems slow, but the seeds are then placed so that the thinning is easy, and it really takes less labor than sowing in continuous rows and thinning afterwards. As the extra early beets are the only ones of interest to the market gardener, they should be sown as early in February as the ground can be worked in good order, in the warmer part of the State, the date being made later as we go westward, till the last of March is as early as safe in the high mountain country. Beets are easily killed by frost as they germinate, but will stand quite a frost after they are well up and the leaves developing, and the trucker who wishes to get his crops into market at the earliest date always takes some risk. The earliest beets are now grown in heavily fertilized frames, under the protection of glass sashes or cloth. Glass is far better than cloth. In the frames the seed may be planted in rows across the width of the frame, about eight inches apart, and should be thinned to three inches. We sow them in frames in January, and protect the glass with mats on very cold nights, and in this way we can get beets of a marketable size about the time they will be just getting above ground when sown outside. The frames should be heavily manured with well-rotted manure, and about one-fourth of a pound of a high-grade fertilizer added to each 3x6-foot sash, and well mixed in the soil. After they are up their growth may be much accelerated by a dressing of nitrate of soda, applied carefully between the rows, so as not to touch the foliage. Early beets should be tied in bunches and packed in barrels for shipment, four to six being put in a bunch, and the tops slightly trimmed. Scarlet turnip radishes may be sown in the beet rows outside, to come up quickly and mark the rows, and to be pulled out before the beets need all the room. When grown in frames, under glass, beets need close attention to airing, and in all warm and sunny weather should have the sashes pulled down, and even when cold, if the sun is shining, the sashes should be slid down slightly to prevent too much heat.

EARLY BEETS.

The following are the best of the early varieties:

Extra Early Bassano.—This is now little grown by market gardeners because of its light color and large top, which makes it unhandy to bunch. But for the home garden it is a far better quality than the other extra early sorts, and while it is not of so dark a red when cooked, it is far better in quality than others.

Early Egyptian.—This is a very dark red beet, almost as flat in shape as a flat turnip, and is a very early sort, with a small top, and hence has been a favorite sort with truckers. It is fairly good when quite young, but rapidly loses quality as it grows older, and hence has been largely superseded by the

Early Eclipse.—This is rounder in shape than the Egyptian, of a brighter red color, and fine quality, and makes a heavier crop and is of greatly better quality.

LATE BEETS.

These are of little interest to the Southern market gardener, but are of value in the home garden. The seed should be sown in July or August, and can well take the space from which early crops have been gathered. The following are the leading varieties:

Long Blood.—Every seedsman has his special strain of the Long Blood beet; some, perhaps, a little better than others. It needs a deeply prepared soil and a rich one. When hard frosts threaten plow furrows over the rows, completely burying them, and they will keep well during the winter. In the cold, elevated sections they should be lifted and stored like turnips.

Half Long Blood.—This is a better sort for shallow soils, and is a fine cropper and of good quality and keeps well in winter.

Sugar Beet.—There are several varieties of this beet grown for the manufacture of sugar, but for this purpose our climate is not favorable. But as a table vegetable for winter use we consider the sugar beet better than any other, though some may object to the white color, as they always think a beet should be red.

Swiss Chard or Silver Beet.—This is a vegetable seldom grown in the South, but one which should be more largely grown for family use. The plant makes a large top with leaf stalks of silvery whiteness in the common variety, though there is a variety with golden yellow leaf stalks. The leaf stalks and the midrib of the leaf are the parts eaten, as the root is worthless. The outer leaves are pulled off as they develop and the stalks are cooked and served like asparagus, and when once enjoyed the vegetable is sure to have a place in the family garden. The seeds are sown like other beets, in April or May, and thinned to stand about four inches apart in the rows. The leaves can be pulled all summer, as new ones are constantly produced as the outer ones are removed.

The Mangel Wurzels are immense beets that are sometimes grown for cattle food to give the stock a succulent feed in winter. But they are less grown of late years since the development of the silo, which has supplied in a cheaper way all that the Mangels did.

BORECOLE OR KALE.

Kale is largely grown in the South for shipment North during the winter and early spring. In hard winters, when the Northern crop is killed, the crop is at times quite a profitable one, but often is hardly worth the shipping. The variety most commonly sown is the Dwarf Green Curled Scotch. About Norfolk the variety known as Tait's Favorite is largely taking the place of this, as it is very hardy and slow to run to seed. The Scotch kale is sometimes sown in beds like late cabbage and set out later in the same way as cabbage. Grown in this way it is a very fine vegetable after frost has touched it. The seed is sown in drills from middle of August to last of September. The rows are made two feet apart and thinned to six or eight inches apart. It needs heavy manuring, and is greatly benefited by dressings of nitrate of soda between the rows while it is growing. Truckers sow 5 to 7 pounds per acre, so as to be sure of a stand, as the flea beetle is often a serious enemy. Dusting with fine tobacco dust is the best preventive.

BRUSSELS SPROUTS.

This is a vegetable seldom grown in the South, but which should have a place in every family garden. The seed should be sown early in the spring, and set in rows, precisely as the collard is planted. The plant makes a tall stem with a spreading head like a collard, and the stem is covered with little heads the size of walnuts throughout its whole length. They can be laid down and covered with straw in winter, and are ready for the table after frost. The top can be eaten like a collard, but the best edible parts are the little heads on the stem, which are much improved by frost, and should not be protected till towards Christmas. The best variety is the Roseberry.

CABBAGES.

There is no crop grown that is of more general importance than the cabbage crop. The early cabbages are one of the most generally profitable crops with the truckers of Eastern North Carolina, while the late fall crop is of equal importance to the growers in the mountain section, who aim to supply the markets of the lower Southern coast, where it is a difficult matter to grow late cabbage. The same is true of a large part of the warmer section of North Carolina, and the difficulty in getting good winter and fall cabbages is such that the private gardens seldom show any late cabbages at all, but only the collard, which seems here to be the survival of the fittest, as it will flourish under climatic conditions that forbid the growing of winter cabbages. But good late cabbages can be grown in all sections of the State, as we will endeavor to show.

EARLY CABBAGES.

Seed for the early crop should be sown at intervals from the middle of September till the middle of October. The early sown ones may get too large in the fall, if the season is late, and will be apt to run to seed in the spring without heading. Therefore it is always best to make several sowings, so as to have plants of fair size to winter over—neither too large nor too small. In the eastern coastal plain the plants can be set in November on the south side of sharp ridges running east and west, setting the plants somewhat thicker than they are wanted to stand, so as to make up for some winter loss. About ten inches apart will be a good distance, and if too thick in the spring they can be cut out for greens. In setting the plants they should be put in the sides of the ridges, so as to be on the level when the ridge is worked down, and deep enough to entirely cover the stem, which is the tender part.

Though cabbage plants usually stand the winter on ridges as far north as Baltimore, we find that in all the upland country of North Carolina they are apt to be killed in February. The warm spells we are apt to have in winter start the plants into a tender growth, and then the severe cold we are almost certain to have about the middle of February will kill them. Therefore, I have found it better here to sow the seed about the first of October, and later on to transplant them about two or three inches apart in cold frames. No protection is given to the frames except when the weather threatens to be very cold, and then cloth can be drawn over the plants at night and left on till the plants are thawed out the next day, for the sudden exposure to the

sun will often do more harm than the degree of cold. These plants are transplanted to the open ground the latter part of February or early in March in land that has been heavily manured with stable manure and fertilizer, for we have found that while good cabbages may be grown with commercial fertilizers alone, the best results are always had when some manure is used in connection with the fertilizer.

The greatest manurial needs of the cabbage family are for nitrogen and phosphoric acid. It is one crop with which deep working is far better than shallow. A skeleton cabbage plow without mould-board, run deeply between the rows up to heading time, will be a great advantage. The soil cannot be too heavily fertilized for cabbages, as they are gross feeders and their success depends largely on the amount of available plant food at hand in the soil. Hence, in addition to a good dressing of well-fined stable manure, I would apply 1,000 pounds of a high-grade fertilizer. After the plants have started well to growing, a dressing alongside the rows of nitrate of soda, at the rate of 100 pounds per acre, will hasten the earliness of the crop very materially. Earliness is the great characteristic sought, and hence few varieties are grown by the market gardeners. The following are the varieties most commonly grown:

Tait's Extra Early Pilot.—This is the earliest cabbage to make a fair marketable head, being several weeks ahead of the Early Wakefield, which has long been the standard early cabbage. While not making so hard a head as the Wakefield, it makes a head that enables the grower to sell it before the Wakefield comes in, and thus to get a larger price. It should be grown to a limited extent for market and also for the family garden. A subvariety of this is offered under the name of New American Hard Head Pilot, which is said to be a cross between the Extra Early Pilot and the Early Wakefield, and, while later than the Pilot, is earlier than the Wakefield.

Extra Early Jersey Wakefield.—Every seedsman claims to have a specially pure stock of this popular variety, and there is a great competition among them in getting the best seed, for the Wakefield is more generally grown by market gardeners than any other early cabbage. The true Jersey Wakefield has a sharply conical head, and heads very hard, while there are some stocks that are badly mixed with rounded and flat-headed varieties which are later than the true shape.

Charleston, or Large Wakefield.—This is a selection from the Extra Early Jersey Wakefield, and is of larger size and has a very compact head. It is about ten days later than the Extra Early Wakefield, and usually sells well.

Henderson's Summer.—This is a second early cabbage, selected from the Wakefield, and is the same as the round-headed variety often found mixed with the stocks of Early Wakefield. It comes in very handily in the family garden, and with the next variety will fill the place of summer cabbages as late as they can usually be grown in the warmer parts of the State.

Succession.—This is a large, round-headed cabbage, similar to what has long been known as Fottler's Brunswick. It makes larger and later heads than the Early Summer and can be had in perfection here till early in July. Valuable for the home garden. The seeds of the Early Summer and Succession should be sown in cold frames in February, since if sown in the fall they are apt to run to seed without heading.

LATE CABBAGES.

In all the warmer parts of the State there is a real difficulty in getting good late cabbage. Hence, it has become the general practice to depend on the collard for late greens. In the warmer sections of the State it is useless to try to head cabbages in the early fall, as is done in the high mountain region, where the crop is largely grown to supply the markets of South Georgia and Florida in August and September. There the growers practice the same methods that are successful in the North, sowing the seed in early spring and transplanting to the field later and growing them through the summer. East of the upper Piedmont and mountain sections we cannot adopt the Northern plan with success, for the plants carried through our long summers will utterly fail of success. Late cabbages, like the early ones, need a heavily enriched soil, but, being grown at a season when we are apt to have dry weather, water is the most important thing for them. For winter cabbages in the central and eastern parts of the State, the seed should not be sown till the first of August. The seed bed should be made convenient to water and should never be allowed to suffer in the slightest degree for lack of moisture. Daily waterings—soakings, not sprinklings—are essential to the getting of strong plants for setting in September. The plants should be set three feet apart each way in level and naturally moist soil, and if means are at hand for irrigation in dry weather, all the better. The object is to keep the plants growing rapidly all the time from the time they appear above the ground. If the land is heavily manured and the plants well cultivated and never allowed to suffer from drought, we can make as good cabbage in the warmer parts of the State as anywhere. Even the collard will do better in this way than the usual method of sowing in spring and carrying the plants through the summer to get long-legged. There is a notion among some that the collards must never be cultivated in "dog days," and it is only the power the plant has to resist climatic conditions that enables it to survive such treatment. But, well treated, we can get good, well-headed cabbages just as easily as we can get the inferior collard. The cabbages sown and treated in this way will make their best growth during late October and November and will be ready to head in December, which is as early as we should have them to keep in winter.

KEEPING WINTER CABBAGES.

A great many plans have been proposed for the keeping of winter cabbages. In the North the common plan is to take them up when cold weather threatens and turn them upside down in trenches and cover with earth. Here the best method east of the mountains, if the land is not wanted at once for other crops, is to turn the cabbages over where they grow, with the head to the north, and then cover the stem and lower part of the head thickly with soil, leaving the top exposed. But, being turned away from the winter sun, it will not be damaged, for the sunshine in winter does more harm to frozen vegetation than the degree of cold. If it is desirable to remove the cabbages from the ground, the next best plan is to plow out deep furrows in a well-drained spot and set the cabbages in the trench as closely as they can be packed, and fill the earth back up to the top of the heads and then throw a little straw thinly over the rows to shade them. Collards turned down in

the patch and covered in the way advised for cabbages will be bleached and made far more tender in winter.

The catalogues give long lists of varieties, but for general purposes the variety known as Premium Late Flat Dutch is as good as needed. In fact, it is stated on good authority that one seed grower on Long Island furnishes fourteen varieties of cabbages to seedsmen, who give them special names, while all are from the same lot of Flat Dutch cabbage seed. The Flat Dutch is a large, short-stemmed cabbage and a very sure header and good keeper. For the family garden, where quality should rule, we prefer the following:

Drumhead Savoy.—This is the largest and latest of the Savoy class, which are all distinguished from the other cabbages by their closely wrinkled leaves, and are said to resist the ravages of the cabbage worms better than other cabbages, while they are of greatly superior quality.

Of late years, in Central and Eastern North Carolina the summer cabbages have been attacked by a disease popularly called "Yellow Side" and "Yellow Fever." This is caused by a minute fungus, known botanically as a Fusarium, and is near akin to the fungus that causes the cotton to wilt in some parts of the South. No remedy has been discovered for it, and all we can advise is to avoid land where cabbages, turnips or radishes have recently been grown, and to burn over carefully the seed bed in which the seeds are sown. Liming the land seems to have some effect in prevention.

The cabbage is also subject to insect depredations. Among the worst are the so-called cabbage worms and the terrapin bugs. There are two species of the cabbage worm, both of them the larvæ of butterflies. One is striped and the other plain green. The green ones are the larvæ of a white butterfly with black spots on its wings, which can be seen hovering around and laying eggs. The early cabbages are seldom attacked by them, but the late ones are often completely riddled and spoiled. Air-slaked lime, in which a very small portion of salt has been mixed, is one of the best things to destroy them. Pyrethrum, or fly powder, if fresh, is also effective.

For the terrapin bugs, which are sucking insects and cannot be killed by the ordinary poisons, the best remedy is to sow mustard between the cabbage rows. They are fond of mustard, and when gathered on plants can be destroyed by spraying with kerosene. Those on the cabbage leaves can be shaken off into a pan of water covered with kerosene.

CELERY.

There is no market-garden crop in which there has been a greater development of late years than in the celery crop. Formerly it was little grown in the South, except in private gardens, with a great deal of needless work and expense. Many still practice the old method of digging deep trenches for each row, and there is no doubt that good celery is produced in this way, but at a great cost of labor. The great difficulty with celery in the South, as with some other garden crops, has been the following of Northern methods rather than adopting those better suited to a Southern climate. It is useless here to try to get early celery except in the cool mountain climate. In the fertile and moist bottom lands west of the Blue Ridge the Northern methods may be practiced with success and celery produced in the early fall months, while in the warmer parts of the State, Christmas is as early as we can hope to get good celery, for it is a cool-climate plant and will not thrive in our long,

hot summers. In fact, in the warmer parts of the State it is better to get the plants from the North, when time for setting comes, than to try to carry them through the summer here. The plant is a cool-climate plant and the growers North now make a specialty of supplying late plants in quantity at low prices for Southern planting. The plants can be laid down here for about three dollars per thousand, and this is less than it would cost to grow and carry them through the summer here. Formerly nearly all the celery sold in the Southern markets was sent from the North, and the early celery, from July till November, is still brought from Kalamazoo, Michigan, where Holland growers have settled and are producing the crop on low, peaty swamp lands. The Kalamazoo celery is large and fine-looking, but far inferior in quality to celery grown on good moist clay soil. Following climatic indications, growers have of late years found out that in the South the finest of celery can be grown if we no longer endeavor to compete at the same season with the North; and now, after the Northern crop is over, the finest of celery comes in during the winter and early spring from Florida, and fine-looking celery is also brought from California, though, like many other California products, the quality does not keep pace with the looks.

There are thousands of acres of swamp lands in Eastern North Carolina where celery could be produced of as fine quality as the Florida product, and during the winter season. To produce the plants we need a piece of moist and fertile soil for the seed bed. This is put in the finest possible order, and lines are marked out on the surface, very shallow, in which the seed are sown rather thinly. After sowing, merely beat the seed down with the back of a shovel, and then cover the bed with burlaps or old fertilizer sacks to prevent the surface drying. If the weather continues dry, water on the sacking with a fine rose till the seed begin to germinate; then gradually lift the sacking from them and prop it up, and finally remove entirely as the plants get stronger. The sowing should be done about the last of April. Now, never let the plants suffer for lack of water, but keep the ground always moist. When the plants are two inches high, prepare a frame which you can cover with cloth, and transplant the celery two inches apart in rows across the bed wide enough to clean with a narrow hoe. In transplanting, nip the ends of the tap-roots. Shade at once with cloth, after giving a good watering, and then never allow the plants to suffer for lack of water. During the summer the plants will have to be sheared from time to time, and when they gain strength from the transplanting remove the cloth and expose them to the sun gradually. From the middle of August to September is early enough for the final transplanting. Bottom land of a moist, clayey nature is the best land for celery of fine quality, but very good celery may be grown on moist, black, peaty soil. Moisture is essential, and it is useless to try to grow celery in our climate on dry uplands unless means are at hand for copious watering. The best growth will not be made until the nights grow cool and the dews are heavy, and no attempt at earthing should be made until the cool weather of late fall comes, as it will not endure earthing in our hot September weather. In the North celery is commonly planted in single rows about four feet apart, and is slightly earthed up in the rows and later taken up and stored in narrow trenches. But in the South it is not necessary to lift it, and the plants are best grown in beds, since it is as easy to earth up a bed as to earth up a single row. In setting celery we make the beds five feet wide and

as long as needed, leaving a space of eight feet between the beds for earthing purposes. We make a setting-board a foot wide and six feet long. Notches are cut, beginning six inches from the end of the board on each edge, and the ends of the board are made perfectly square. There will thus be eleven notches on each side of the board. To set the plants, a line is stretched taut on one side of the space where a bed is to be planted. Beginning at one end, the setting-board is placed with its end perfectly square with the line. The planter stands on the board and sets a plant at each notch. It is then moved and the notches on the other side made to correspond with the plants set, and another row is planted at the notches on the other side. Proceeding in this way, we finally have a bed set perfectly uniform with rows a foot apart and plants six inches in the row. The bed is well soaked after planting, and nothing further is needed except to keep the beds clean and cultivated till the time comes for the earthing. The beds should never be worked when the plants are wet with dew or rain, as this favors the rust. When the stalks grow large and liable to fall over on the ground they should have the first slight earthing or handling, just enough to keep them upright. To do this, we use two cords with pointed pegs in each end and a foot or two longer than the width of the bed. Beginning with the first row, we stick a peg in the ground near the end of the row, and then take a turn of the cord around each plant, and at the other end of the row stick the other peg far enough off to draw the string tight and keep the leaves erect. With the other cord and pegs the second row is treated in the same way. Earth from the eight-foot spaces is now shoveled in between the rows in a ridge, and then is drawn by hand down around each plant tight enough to hold it erect after the string is removed. The strings are then taken off and transferred to the next two rows, till the whole bed is handled up. The earthing proper should be delayed till about the first of November; then the cords and pegs come in again to keep the stems of the leaves close together and prevent earth getting into the hearts of the plants. The earth is again drawn to the plants closely by hand, and enough earth is put in to just keep the growing tips above the soil. At each end of the row the earth is carried up six inches beyond the ends of the rows, so that when the whole bed is earthed up it will be six feet wide instead of five. The eight-foot spaces between the beds must be kept plowed and cultivated, so as to furnish at all times mellow soil for the earthing. When the tops grow a few inches above the first earthing, another layer is added in the same way. Finally, along in December, when the weather threatens to turn to hard freezing, we cover the entire bed with soil six inches deep, and then cover the whole with pine straw or other forest leaves and lay corn stalks on to keep the cover from blowing off. The celery is dug from the beds as needed during the winter, and, if for market, must be trimmed, washed and bunched. The roots are trimmed off and one tie placed around just above the root and another to include the tops. Celery grown and kept in this way is far more crisp and of better quality than that which has been lifted and stored, and there is no crop that helps so much to deepen the soil, since the earthing will usually go into the clay below.

Since the introduction of the self-blanching varieties of celery, there has grown up a practice of planting the celery thickly in beds surrounded by boards, depending on the crowding for the blanching. Celery grown in this way will look white and pretty, but will be hardly worth eating. In fact,

no celery is of the best quality unless grown on a moist clay loam and blanched by earthing.

An ounce of celery seed should produce from 7,000 to 8,000 plants. Where grown on a large scale for market, and the grower has the means at hand for summering the plants, he will, of course, grow his own plants. But where one needs only a few hundred or a thousand plants, it is better and cheaper to get them from the Northern growers in late July, transplant to frames for establishing, and then have them at hand when setting time comes. The hot weather of late June and early July is the most trying time on celery plants here.

The following are the leading sorts:

White Plume.—This was the first of the self-blanching sorts introduced, and is still as good as any of them. A few of the self-blanching celery may be useful as early fall celery or for the market crop, where appearance often counts for more than quality.

Golden Self-blanching.—This is claimed to be superior to the White Plume, and as golden celeries are usually of better quality than the white, this may be true.

Schmucker.—This is probably the best of the newer varieties. The stalks are very solid and of a handsome golden hue, and the heart is large. Probably one of the best for market.

Dreer's Monarch.—This is another new celery with golden heart, and is claimed to stand at the head of the list. We have never grown it, but its claims are such that it is deserving of trial.

Boston Market.—This was the first of the dwarf varieties brought out years ago. In our experience there has been none better introduced for family use. It is not a tall celery, but has more white heart stalks than most of the tall varieties. For growing in beds as we advise it is one of the best, though the market grower may prefer one with taller stalks.

Golden Half Dwarf.—This is one of the best of the golden celeries. It is very solid, a good keeper and of fine quality. Good either for home or market.

CAULIFLOWER.

This is the most delicious vegetable of the cabbage class. It has not been grown in the South to the extent it should be grown, because efforts were formerly made to grow it in the same way that it is grown in the North, and our hot weather soon makes it useless. If the plants are sown in late September and merely wintered over, with protection of cloth in severe weather, so as to have the plants ready for setting the last of February, fine cauliflower can be produced in May. In the North cauliflower is grown largely for the fall market, just as late cabbage is, but in the South the plants cannot be carried through the summer. Fine cauliflowers are now produced in Florida during the winter from late-sown seed, and they are now brought from there in large quantities in the late winter and early spring. For the best early crop here, the best plan is to grow them in frames under glass. Set six cauliflower plants to each 3x6-foot sash and fill in with lettuce. By the time the lettuce is cut out in February the cauliflower will be pushing up against the glass, and the sashes can be gradually removed and used for the later lettuce on other frames or for the protection of tomato and other plants

started in the greenhouse. These plants will head in late March and April, and usually sell well, though the price is not now so good as it was before the Florida crop came on the market. Like all others of the cabbage family, cauliflowers need the richest of soil, and are much helped during their growth by dressings of nitrate of soda alongside the plants.

Early Snowball.—This is a selection from the old Early Dwarf Erfurt, and there are a number of names given to about the same strain by different seedsmen. A good strain of this, no matter what the particular name given, is about all that we need in the way of cauliflower, for the taller and later ones are useless in the South.

CARROT.

The same treatment advised for the early beet crop will apply equally well to the carrot. They are little grown in the South for Northern shipment, but a few of the early ones may be made profitable to ship along with the beets grown in frames.

Early Scarlet Horn.—This is the best variety to sow in cold frames for early use. It is small and will bunch as easily as the early radishes.

New Oxheart.—This is one of the best for the outdoor garden, being earlier than the long-rooted sorts and better adapted to heavy soils.

Long Orange.—This is the largest sort, with very long roots, and a good keeper in winter. It is better adapted to stock feeding than to the table, though grown largely for this purpose.

GARDEN CORN.

The extra early varieties of sugar corn are useless in the Southern climate. Hence Southern market gardeners have very generally adopted for the early crop early Dent corn, which, while not so sweet, has the stamina to endure the Southern conditions and to make an early crop. This early Dent is grown under various names, and special varieties have been selected. Being of rather dwarf stature it can be planted a great deal closer than field corn is commonly planted, and is grown in the same way. In the warmer parts of the State these early Dent varieties can be planted in March, at a time when the wrinkled sugar corns would be certain to rot.

Tait's Norfolk Market.—This is the best of the extra early Dent varieties, and is of better quality than the early Adams. The ears are longer than the Adams Extra Early and the plant is a stronger grower. It is rapidly taking the place of the other early Dents.

Adams' Extra Early.—Another of the early Dents. Very dwarf in growth and requires the richest of soil to make a crop. Ears very short. Its earliness is its only merit, and it is no earlier than the first named.

Adams' Early.—This has long been the standard sort of the early Dent corns, but is rapidly being superseded by the Norfolk Market.

SUGAR CORNS.

The following are the best varieties of sugar corn for the South:

Country Gentleman.—This is an improved variety of the Shoe-peg sugar corn, and is characterized by its irregular rows of narrow grains, apparently distributed at random over the cob. It is the earliest sugar corn that will succeed in the South, and it is well to say that all of them need the richest of soil, heavy manuring and good culture for success.

Egyptian.—Why called Egyptian we cannot understand, for it is a selection of American sugar corn of the class of the Mammoth. It is one of the largest-eared and strongest growers of all the sugar corns, making ears as large as field corn. It is largely grown in Maryland for canning purposes, the man who first introduced it growing about 300 acres of it annually for canning and for market. He supplies hotels and clubs in Baltimore at fancy prices. It is not an early corn, but is better suited to the Southern climate than any other. We rely on it for the main crop.

Stowell's Evergreen.—This is one of the latest and sweetest. Not so large as the Egyptian, but keeps in eating condition longer than most corn.

Late Mammoth.—The largest of the sugar corns and of very good quality. Its size sells it as soon as it appears in market, and for a succession to the Egyptian planted at the same time it is valuable.

We once spent seven years at the North Carolina Station in breeding up a sweet corn for Southern use. It was a cross between the Leaming, a western field corn, and the Mammoth sugar corn. It was finally fixed in type as a wrinkled yellow corn, and was of fine quality, and did well in our climate. We developed it in a locality at Southern Pines, isolated from all other corn, but on coming back to the Station farm at Raleigh, with other corn all around us, we concluded that we could not keep it pure. We therefore sent out a large quantity to all parts of the State under the name of North Carolina Station corn, and asked the recipients to take care of it, as we would grow no more. So far as we have been able to learn not one did so, and we suppose that the variety on which we spent seven years of effort is now entirely lost to cultivation. Had we placed it in the trade it would probably now be a standard sort for the South.

One reason why sugar corn so uniformly fails in the South is because we depend entirely on seed brought from the North, which is not acclimated. If we want to have a sugar corn that will uniformly do well in the South, we must breed it here. Not by taking merely the ears that get too old for the table, but by planting some especially for seed, and then selecting seed from the most vigorous and productive plants, taking into consideration the whole plant, and thus get a sweet corn that will uniformly thrive in our climate. Even the extra earlies might in this way be bred up to greater stamina and be brought to a condition to compete with the extra early Dents, while exceeding them in quality. We hope yet to do something in this line. But the greatest results are to be hoped for from the Egyptian, as that variety has been bred south of Mason and Dixon's line.

CUCUMBERS.

The cucumber is one of the most important market crops of the Southern trucker. To get them extra early it is worth while to go to some trouble and expense. Those who are well supplied with cold frames can use them profitably in forwarding the plants for setting in the open ground. For this purpose we use flower-pots of the four-inch size. These are filled with a rich compost of rotted sods and manure that has been piled and turned for several months in advance. We make the compost of two-thirds sods and one-third stable manure, pile in layers and chopped down and mixed several times, till it becomes well decayed and incorporated. The pots are packed closely together in the frames and seed are planted in each, and fine soil is then

sifted over the whole, and the pots are then watered with a fine rose and protected either by cloth, or better by glass. The seed is sown the last week in March, and as the plants grow they are thinned to three in a pot. When the soil is warm, and frost over, they are knocked out and the unbroken balls set in well-manured hills, setting them deeper than they grew in the pots. We have set them when the vines were a foot or more long, and had cucumbers far earlier than is possible from seed planted in the open ground. The pots can now be bought so cheaply and are so convenient for forwarding plants that we no longer attempt the old plan of planting seed on inverted sods, and once in stock the pots will last many years, if taken care of. Every gardener should have a supply of small pots for various plants, as they make the final transplanting so easy and certain.

For starting in the open ground we do not make hills for the cucumbers, as was formerly the practice, but run out deep furrows and fill them with well-rotted manure, or manure composted for some time with black earth from the forest. A good sprinkling of a high-grade commercial fertilizer is added, and a furrow is thrown over the first furrow from each side, forming a ridge. This is then flattened with a roller, and the seeds are drilled on the bed thus formed. Plenty of seed is used, so as to be sure of a stand, and when the stand is assured and the plants have formed rough leaves, they are thinned to a foot apart and cultivated till the vines interfere with it. The planting should be as early as it is safe from frosts. Well-grown cucumbers should make 1,000 bushels per acre of shipping "cukes." All the early cucumbers grown for market are either the White Spine or selections from this variety. One of the best of this strain is

Tait's New Model.—This is claimed to be the best of all the White Spine varieties, and is a favorite with market growers.

Japanese Climbing.—In our home garden we have found this variety a very productive and valuable sort. It is a strong climber, and can be planted by a wire fence on which to run, and can thus be made to occupy little space and give a large supply of fine cucumbers. There are many named varieties of the White Spine cucumber, all of which are very similar.

FORCING CUCUMBERS.

The time is near at hand when the market gardeners of the upper South will be compelled to adopt the intensive methods of plant culture that have been found so profitable in the North. And they have the great advantage over the Northern gardeners in their milder and more sunny climate. Sunshine is of more importance under glass than fire heat, and no amount of artificial heat will make up for the absence of sunlight. In the South we have far more of winter sunlight than in the North, and seldom have the long, dark spells in winter that so annoy and damage the Northern gardener. With the rapid transportation now at hand winter forcing will become very profitable in the South, and of all the crops forced in heated houses in winter there is none more generally profitable than the cucumber. But before attempting winter forcing on a large scale the novice should gain experience in a small way at first, till he fully understands the conditions needed for success. There are valuable books published on this subject, two of the best being "The Forcing Book," by L. H. Bailey, and "Greenhouse Management," by

Professor Taft. With these books, and a determination to succeed, the gardener may soon become expert in winter forcing.

For the general market the White Spine varieties are the ones forced in winter, but where a grower has a critical market and one willing to pay fancy prices, the long English cucumbers can be made very profitable. If one intends to go into greenhouse forcing he should have houses expressly adapted to the plants he intends to grow. There are now a number of firms engaged in the construction of greenhouses, and the heating of them as well, and commercial florists and gardeners now find that it is better to have their houses constructed by men who fully understand the work and know the needs of different crops than to try to get them built more cheaply, perhaps, by local builders, who do not understand these matters. A house for forcing cucumbers must have means at hand for maintaining the proper temperature, such as is needed by tender plants like cucumbers, tomatoes and beans. The proper temperature is about 65 degrees at night and ten to fifteen degrees higher in daytime and sunlight. The plants are grown in beds made of rich compost on the benches of the house, over the heating pipes. The soil in the benches is made six inches deep, and the benches are built to allow drainage, a layer of clinkers being laid over the cracks in the boards to prevent the soil sifting through. The plants are started in four-inch pots filled with the same compost already advised. The pots are filled only about half full and the seed planted and covered lightly. When two rough leaves have developed the pot is filled up. When the pots are well filled with roots the plants are knocked out in balls and set in the soil on the benches, setting the balls rather deeper than in the pots. An abundance of plants should be grown, so that only the most vigorous ones need be used, for there is no plant forced that is liable to so many diseases and insects as the cucumber. The plants are set along the front of the bench and are trained upon wires under the glass. Formerly it was the practice to take the pollen from the male flowers and set the fruits on the female flowers, but it has been found that with most cucumbers this is not necessary, as they grow equally well without pollination, and as seeds are not desirable, it does not matter if none are formed. The plant louse, or aphis, is sometimes troublesome, but they can easily be kept down by covering the beds with tobacco stems before any appear. In houses that are let get too cold the mildew is apt to be troublesome, but if close attention is given to the ventilation and heating, and the plants are not overwatered, there will be little trouble from this disease. Forced cucumbers usually bring during the winter $3 per dozen and upwards.

EGG PLANTS.

The egg plant is not very largely grown in North Carolina, either in private gardens or the market gardens. If gotten into market very early, they sometimes bring profitable prices, but later the price rules too low for profit on a bulky article. For the best results with egg plants the market gardener needs to have greenhouses and frames with glass sashes in abundance, for the plants must be started early and grown on rapidly under glass till the ground outside is permanently warm. We can gradually harden off the tomato plants to withstand a very considerable amount of chilly weather, but any attempt to harden the egg plant to a moderately low temperature will only result in stunting it and making a poor crop. We sow the seeds in

flats in the greenhouse in February, and as soon as the plants are large enough to handle they are potted in three-inch pots filled with rich compost. When these pots are filled with roots they are shifted into four-inch pots and the houses are never allowed to get lower than 65 degrees at night and ten degrees higher in daytime. In the four-inch pots the plants can be grown to a large size, and when the ground is warm and the weather settled they can be knocked out of the pots and set in their permanent quarters, three feet apart each way. The soil cannot be made too rich, and a mellow-sandy soil is best. Those who have a large number of frames and glass sashes in which lettuce has been grown during the winter, and the tomato plants hardened off in the spring, can make a very profitable use of the frames after the tomato plants are out by setting two of these large pot-grown egg plants to each sash. Then keep the glass over them at night so long as the nights are cool, and forward them by watering and top-dressings of nitrate of soda. In this way years ago in Northern Maryland, having nearly 1,000 sashes empty after the tomatoes were set out, I set them in egg plants that had been developed in pots to a large size, and had the fruit ready for market as early as the Charleston growers. Herein consists the great value of the glass sashes. They enable us to compete on somewhat equal terms with growers far south of us. Our market gardeners have too long depended on the advantage their climate gives them in competing with the growers north of them. The rise of the lettuce culture in winter has shown them the value of intensive work in the forwarding of plants to compete with those south of us, and it is to this intensive culture that the gardener of the upper South must turn his attention for the best results. Egg plants put on the market the last of June or early July will be profitable, while those in August meet too many competitors.

The best variety of egg plant for market purposes is the one known as

New York Improved Purple.—Various strains of this are offered by different seedsmen, who claim special breeding and selection for their strain. One of the best of these selections, which has been recognized as such by truckers, is

Tait's Purple Perfection.—This variety has been used and commended by the market gardeners around Norfolk, and is probably one of the purest strains of the round purple egg plant in the trade.

Black Pekin.—This is rather earlier than the New York Improved. It is a very productive variety of a very dark purple color and handsome, round fruits. But in size it is inferior to the other and is not so largely grown for market. In our experience it is more resistant to the "Southern blight," which attacks both egg plants and tomatoes in the South, and will sometimes make a crop where the New York Improved fails. The Colorado potato beetle is just as fond of egg plants as it is of potatoes, and the same means of spraying with Paris green is necessary. With the egg plant, however, we prefer to mix the Paris green with tobacco dust, one part of the green to 75 parts of the dust, and apply it with a powder bellows made for the purpose. The tobacco dust makes the mixture equally effective against the flea beetle, which is very troublesome. No remedy has been found for the Southern blight, and all we can say is to avoid land where tomatoes or egg plants have been lately grown. Egg plants can be grown well with a heavy application of a complete fertilizer, rich in nitrogen, but some stable manure added to the fertilizer will always produce the best results.

LETTUCE.

Lettuce has of late years become the most important crop of the North Carolina truckers for shipping in fall, winter and early spring to the Northern markets. The best means for producing the best crops is, therefore, of increasing interest to our growers. The production of lettuce for market during the winter and spring forms the beginning of intensive culture with our truckers, and will lead eventually to still more intensive work in forcing under glass. Lettuce is very largely grown, from the open ground in Florida to the heated greenhouses of the North, during the winter months. It is an article with which the market is seldom glutted, and the slight protection needed in our climate for the production of good lettuce gives the North Carolina grower a great advantage over the Northern grower, who has to use expensively built and heated houses. Our growers have gone far enough to put their lettuce on a par with the Florida lettuce in winter, but not far enough to enable them to compete with the superior quality grown in the Northern greenhouses. Hence we find in the market reports separate quotations for Southern lettuce and hothouse lettuce, as the Southern lettuce, owing to the way in which it is grown, is apt to be either frost-bitten or less brittle and tender than the hothouse article. There will always be this difference, so long as our growers adhere to the method of growing the lettuce under cloth instead of using glass for the crop in winter. With glass, and mats to cover the glass in extremely cold weather, and thus to completely exclude the frost, and shipping the crop in carriers, like the hothouse crop, we can produce fully as good lettuce as is grown in the heated houses North, and thus get a better price for it. The objection made when I have urged our growers to use glass is simply that the glass costs so much. It costs far more in the North to build lettuce houses and heat them with costly hot water or steam apparatus, and yet the growers there keep on building these houses and making them profitable. But the fact is that frames with glass sashes cost less in the long run than the cloth-covered frames, now so largely used by our lettuce growers. The first cost will be four times as much as the cloth, but if the sashes are taken care of and kept painted they are good for at least twenty years, while the cloth is often mildewed and worthless after one season's wear, and always so in two seasons. Then, when we consider the superiority of the product, its safety from disaster, and the better price obtainable for it, the glass will not be long in paying for its extra cost. The mats needed are easily made at home from broomsedge or rye straw. The rye straw mats are lighter to handle, but the broomsedge mats are more lasting. I have now mats made of broomsedge that have been used for three winters and seem still as good as ever. To make these mats we have a frame seven feet long and four feet wide. Six strands of tarred twine are stretched lengthwise the frame. The frame is placed on carpenter's tressels, and beginning at the lower end we lay small handfuls of the broomsedge, with the tops lapping in the middle and the butts at the sides. With more tarred twine in balls we take a turn over the straw and around the stretched twine and draw it down tight, and proceed in the same way to the top of the frame, when the ends of the twine are made secure and the mat is cut from the frame, edges trimmed straight and all loose strands removed. It is now easily rolled up and stored ready for use, and being slightly larger

than the 3x6-foot sashes, the mat will cover all cracks, and if the frames are properly made and banked outside with earth, the mats will exclude any frost we are apt to have, even in the dead of winter. In fact, I have flowers of various sorts blooming in such frames all winter perfectly. The cloth frames are useful for the first fall crop, when little protection is needed. They are also useful merely to keep over winter late-sown plants, covered only in severe weather, for heading in the spring in the open air. But for winter work the cloth frame can never compete with the glass-covered frame in the production of fine lettuce.

GROWING FRAME LETTUCE.

In the culture of winter lettuce, the first consideration must be the soil. After years of experience in the production of this crop, I have found that some stable manure is essential to the production of the best lettuce. But stable manure alone or commercial fertilizers alone will not furnish the finest lettuce. Both are needed by the lettuce grower. The same fact has been demonstrated in the experiments made at other Experiment Stations. It is also necessary either to entirely renew the soil in the frames annually or to move them to a new spot. A soil in texture between a sandy and clayey loam is the best. Too light a soil makes light lettuce, and too heavy a one keeps the crop back. My practice is to begin in the early spring and get together sods from a loamy piece of land, cut about two inches thick. These are laid grass side down and a light layer of manure spread over each layer of sod. If the sod is from heavy soil, I add some wash sand to lighten it. Good, rich, black earth from the forest can be used in place of sods, if these are not available. The heap is made broad and flat, and every two or three weeks during the summer is chopped down and mixed thoroughly, so that by fall it is a black, mellow compost, and the best possible soil for the frames. This compost is put into the frames, after taking out the old soil, to a depth of six inches. Some weeks before planting I add half a pound of a high-grade commercial fertilizer, in which there is about five per cent of potash and about the same of organic nitrogen, with a due amount of phosphoric acid, say about seven per cent to each 18 square feet. This is well mixed with the compost and allowed to stand a week or two, till the potash gets less caustic, for the muriate of potash is apt to burn the roots if freshly applied in such a large amount.

Arrangements are made for the production of four successive crops. For the first crop we sow seed of the Big Boston lettuce the last week in August. I scatter the seeds thinly broadcast, sowing enough to make three times as many plants as I will probably need, so that single standing and stout plants can be selected for transplanting, as these always do better than plants that have been crowded, and if sown in rows in beds, we are apt to have the plants crowded. These plants are set in the frames, to be protected later with cloth, if needed, but often, as in the last autumn, the crop is made without any protection. This variety of lettuce is set a foot apart each way, and, with slight protection after the nights grow frosty, it will run through the latter part of November and up to Christmas.

Seed of the same variety of lettuce is sown about the middle of September, or even later, if the weather is unfavorable earlier. These plants are set in frames that are to be covered with glass at the same distance in October, and

if properly protected with the sashes when the nights grow cold will immediately follow the Christmas crop and run through February. When the glass is on care must be taken to air the frames well in all mild weather, so that the lettuce does not grow too tender and flabby. We give some air in the frames by slipping the sashes down more or less whenever the sun shines, even if below the freezing point, and whenever the mercury is above freezing and the sun shines we strip the sashes down entirely. When the nights promise to be very cold the mats are brought into use and the sashes covered by sundown.

For the March and April crop we sow seed about the first week in October, still using the Big Boston. These are set in the frames in November, and kept as cool as practicable during the winter by only slipping the sashes over them when the nights threaten to be quite cold. Up to the time when the heads form lettuce is very hardy and will stand a considerable amount of freezing, but once headed it is easily scorched by frost, and as the sun gets higher in February, the same care is given this crop as that which is headed during January and February. This crop needs more attention to airing than the winter crop, as the sun is continually getting higher, and by the middle of March the sashes can be left off entirely, except when a sudden reverse threatens.

For the fourth crop we use seed of the Wonderful lettuce. This is a remarkable large-growing lettuce of the Curled India type. It makes immense and hard heads, but does not head till spring, and hence is useless for the winter crop. Have since found the Wonderful fine for winter use, and it will supersede the Big Boston. We sow the seed of this any time in October and set the plants rather thickly in frames, to be protected in very cold weather with cloth, the object being simply to keep them alive during the winter and not to grow them much. Hence no protection is given them till it threatens to go down to ten or fifteen degrees above zero. By the middle to the last of March these plants are set in the open ground in heavily manured soil, a foot apart each way, and due attention given to their cultivation. In fact, we should have said that this same care in cultivation is given to all the crops in the frames. This crop will begin to head in April and will run well into May, and often pays better than any other, as the heads are usually large, and come into market at a time when lettuce is in great demand and the Florida crop is no more, while the outdoor crop North has not come in. Some of our growers say that it is useless for us to attempt the midwinter crop, as Florida has the run of the market then. But the crop grown under glass sashes is so superior to the Florida crop that there is no danger that it will not sell well. In fact we have found it better paying than the Christmas crop, while the lettuce that goes to market in March and April and May always brings the best price of the season. I have tried to treat this important crop fully, as its importance demands. I have named the two varieties best suited to the market grower. There are some others that will be of interest to the home gardener, and of these we will now speak.

All the Year Round.—This is the quickest-heading lettuce we have grown. The heads are not of large size, and the plants can be set in frames six inches apart each way, and, of course, a great many more can be grown in the same space than of the larger heading sorts.

Boston Market.—Another early heading variety of better quality than the first named. It is largely grown North in houses, but our growers prefer the Big Boston, which was selected from this variety. It is very similar to the Big Boston, except in size.

California Cream Butter.—This is a close competitor with the Big Boston as a winter lettuce. It is a little longer in heading, but is more compact in its growth and less widespread in its outer leaves, which allows it to be planted a little closer than the Big Boston, while the heads are fully as large. In some soils it may prove better for market than the Big Boston.

Grand Rapids.—This is the great forcing lettuce in the West. But our Eastern markets demand a cabbage lettuce, while the Western cities prefer the loose, curled lettuces, of which the Grand Rapids is the best. We think that the Western people are right, and for family use we greatly prefer the Grand Rapids, as it is far more delicate and tender than the Big Boston. But when growing for the markets of New York and Philadelphia it is useless to plant the loose-heading varieties.

Hanson.—This is a variety of the Curled India type which was grown by the late Colonel George Hanson of Maryland. There have been several special strains of it developed, the best of which, in our experience, is Maule's Improved Hanson. This is a lighter green than the Wonderful, which it otherwise closely resembles. For a spring crop the Hanson is excellent, but not suited to the winter crop.

There are long lists of lettuces in the catalogues, but the above list covers all of real value to the Southern trucker, so far as our experience goes, and many in the lists are merely duplicates. There are a number of lettuces specially recommended as hot-weather lettuces, but in our experience none of them are worth growing here, for when the weather gets warm no lettuce is fit to eat, and May will usually wind up the crop with us after full six months' use of it. Few other vegetable crops have so long a season, and we can well dispense with lettuce during the other six months, when the garden abounds with other vegetables.

We have said nothing about the greenhouse forcing of lettuce, because it is of no interest in this climate, unless it be in the mountain section, where the winters are colder. But even there the bright sun of the South prevails, and a greenhouse will be apt to be too warm for the growing of any but the Grand Rapids, and even in the mountain country good lettuce can be produced in cold frames in winter if the frames are sunken and banked to the top on the outside and mats are used on the glass. I have grown it in this way in a very cold locality in northern Maryland, near the Pennsylvania line, where we had the mercury below zero every winter, and my frame lettuce was as fine as any product of a Northern hothouse. I have grown frame lettuce with success for market in a warmer section of Northern Maryland, and have grown it with great success in Southeast Virginia and here in North Carolina, and what I have written is the result of a long experience of about 40 years in growing frame lettuce, added to experiments made here more recently.

MUSKMELONS.

The muskmelon, or cantaloupe, as it is commonly called, is a very important crop with the Southern market gardener, so far as the early varieties are concerned. Early melons of small size are more profitable than larger and later

ones, and are more desirable to consumers. Very large melons are apt to be of inferior quality, like the immense late melon known as Montreal Market, which, however it may suit the growers North, is, in our experience, of too poor a quality to make it desirable to grow in the South, and it is too large and late for any but a local market where size counts for more than quality.

The soil for melons should be a warm loam, neither too sandy nor heavy. Private growers usually plant them in hills about five feet apart each way, but we prefer to grow them in rows. The land should be thoroughly and deeply prepared, and deep furrows run out five feet apart, running the plow twice in the furrow. A compost of black earth from the forest and cow manure mixed, two-thirds of the first and one-third of the manure, should be prepared some months ahead and made fine by repeated turning and mixing. The furrows are filled with this compost and a liberal addition is made of a high-grade complete fertilizer. Two furrows are then lapped over the manure, making a ridge. This ridge is then rolled nearly flat and the seed drilled in on the bed thus made plentifully. As soon as the plants are well established they are thinned to a foot apart in the rows, and are kept cleanly cultivated till the vines run and interfere with cultivation. Cowpeas are then sown all over the ground, so that by the time the melons ripen there is a slight shade, and after the crop is gathered the peas can be allowed to grow and make a hay crop. For the market garden few varieties are used, and these only of the earliest. The following will comprise all of special value to the trucker:

Early Jenny Lind.—This is an early, small and productive melon, much flattened at the ends, and packs easily in crates for shipment. It has long been the favorite variety with the truck growers of Eastern North Carolina, but there is some prospect that it may be superseded by the market demand for

Rocky Ford.—This melon has acquired this name from its being so largely and successfully grown at Rocky Ford, Colorado. It is really an old variety, the Netted Gem, but the name Rocky Ford has now gotten so attached to it, and attained such importance as a market brand, that it will probably take the place of its former name. It is a very productive melon, of small size and round shape, not flattened at the ends like the Jenny Lind. In quality it ranks among the best. These two varieties will be all that the Southern shipper needs.

The following are fine for private gardens and are also grown to some extent for market, especially the local markets here and in the North:

Emerald Gem.—This is about the best of the yellow-fleshed melons. It is medium early, has very thick flesh and on the outside is green with faint white stripes. It is grown to some extent for shipping, and is one of the finest for family use.

Tait's Ideal.—This is a fair-sized melon of great productiveness and high quality. Skin is well netted and the flesh is reddish-orange in color and very aromatic. It succeeds best on high sandy soil.

Acme or Baltimore Market.—This is a nutmeg-shaped melon of fine quality and productiveness, grown largely about Baltimore, and well suited to a local market.

Banana.—This differs from all other melons in shape. The melons are smooth-skinned and more the shape of a Mammoth cucumber than a melon. I have grown them over three feet long. The flesh is yellow, and at times

a specimen will be of very fine flavor, but usually they are of very poor quality. Grown mainly as a curiosity.

Hackensack.—A fine melon with green flesh and round shape, well-netted skin and medium to rather large size. Generally of good quality, but variable. Popular in New York market when grown near by. For family use in the South it is worth growing, as it is very productive and generally good here.

Of course the catalogues give a much longer list of varieties, but the above will leave little to desire.

MELON (WATER).

The watermelon is a very important crop in the South, more as a farm crop than with the regular market gardener, and is usually a specialty with those who grow them as their sole market-garden crop. Most of the varieties in use have been developed in the South, and the trade is entirely supplied with Southern-grown seed, since the sun and long season of the South are better suited to the perfecting of the melons than a Northern climate is. To grow watermelons to perfection one must have a high, warm, sandy soil. While they may be grown in a different soil they never reach the same size and perfection which they attain on the sand. The old practice in growing watermelons was to check off the land, after plowing, about ten feet apart each way. At the crossing of the checks wide holes are cleaned out and a shovelful or two of the compost named for muskmelons put in each hill or hole, fertilizer sprinkled over and then covered and the seed planted. I have found that the following plan gives better success: Plow the land in lands twelve feet wide. Plow out the dead furrows clean, and if there is a clay subsoil run a subsoil plow in the dead furrows to loosen it. Fill the cleaned-out dead furrows with the compost. Scatter a good dressing of high-grade complete fertilizer on this and then throw furrows from each side to make a ridge. Drill the seed along this bed after flattening it. When the plants are established thin out to three feet apart. Now work the soil to the rows as the plants grow, till, when the crop is laid by, the plants are on top, the land and the dead furrows are between the rows. By throwing the earth to the plants in this way we get the roots deep in the ground and in more moist soil, and are less troubled with borers in the stem. I have had far greater success in this way than in hills, though fine crops may be grown either way. Cow manure is always better for making compost for melons than horse stable manure.

The varieties of watermelons grown for shipping and those grown for private use will always differ, since in the shipping melon handsome appearance and toughness of rind are the qualities most sought, and these are not always or generally associated with high quality. Hence the grower for home use seldom plants the same varieties which the shipper must use. The most popular shipping melon is

Kolb's Gem.—This is a round and compact melon of fair size, with mottled stripes of light and dark green on the outside. It stands shipping better, probably, than any other, and when cut the flesh shows a beautiful ruby-crimson. It is not, however, of the best flavor, and the flesh is rather stringy, but its beauty and shipping toughness render it the favorite for shipment in cars and steamers.

Cuban Queen.—This variety is valued by those who wish to grow immense melons. It is similar in outer color to Kolb's Gem, but longer in shape, and

grows to a great size. The rind is thick and will bear shipping, and the flesh is of better quality than Kolb's Gem. It may be grown to 70 to 100 pounds weight.

Scaly Bark.—A melon with a mottled surface and medium size. It has a very tough rind and is said to ship well.

Duke Jones.—An immense round melon with very dark green skin, thin rind and flesh of the highest quality. It is one of the most prolific melons grown. I have seen a vine bearing 36 melons, several of them of very large size, and 50 to 75 pound specimens are common. It is rather brittle for long shipment, but for home use is hard to beat.

Southern Triumph.—This is claimed to be the finest and largest of all watermelons, averaging heavier than any other and often weighing 80 pounds. The flesh is bright red and of fine quality.

McIver or Sugar Melon.—In point of quality we consider this the best of all watermelons. It is similar in general appearance to the Cuban Queen, but longer and not so thick. The rind is remarkably thin, and it has the fine quality of never getting hollow in the center in wet weather as most melons are apt to do. In beauty and tenderness of flesh and high, sweet quality, I have never seen its superior, and it can be grown to a very large size. I have seen a field of this melon where it originated, in South Carolina, where one could almost step from melon to melon over the field. It is also quite early.

Muskile.—This is a melon very popular with the growers on the Eastern Shore of Virginia, and they guard the seed so carefully that it is almost impossible to get them. It is a melon of high quality, with a very thin and brittle rind, and not suited to distant shipment, except by water.

There are many other varieties in the trade, but the above will include the most valuable ones for home or market. The growing of watermelons for the North is rapidly increasing in North Carolina and, while they can be grown in all parts of the State, the largest and finest are grown only in the sandy lands of the warmer and eastern sections, the mountain melons never comparing in size or quality with those in the warmer sections. Watermelons are shipped usually in slatted cars, the number in a car varying with the weight.

MUSHROOMS.

No mushrooms are produced for market in North Carolina, but as some may wish to know how to grow them for home use, we give the following directions, promising that we have never known any one to succeed in the first effort, as they are apt to omit some little matter that is important but looks trifling to them. When one "gets the hang of it" mushroom growing is easy. They can be grown anywhere, in outhouses or cellars, or even in the open ground in the fall. Some of the finest we have ever grown were produced in a compost pile we were preparing for the lettuce frames in the fall. Fresh horse manure, free from straw, is needed. If this is not plentiful it can be spread out under cover, so that it will not heat till enough is collected. Then mix it in equal parts with sods from an old pasture and pile to heat under shelter. Turn it two or three times till rank heat is over, and then pack in beds about four feet wide and two feet deep. If the compost is dry, water with water just hot enough to bear the hand in. Now put in a thermometer and watch the bed as the heat rises. When it has reached its

highest and has begun to subside to about 85 or 90 degrees, have some bricks of spawn, which can be bought from the seedsmen, and chop them into pieces the size of a hickory nut. Stick these in the compost all over the bed about six or eight inches apart and then scatter the finer part over all. Cover the bed with straw and watch it closely. When you can see the mycelium running like a spider web through the compost, and not before, cover the bed with an inch or two of fine garden loam and return the straw. If the bed gets very dry water over the straw with water at about 100 degrees temperature, and if all goes right the mushrooms should appear in five or six weeks, and the bed will be productive for an equal time if the mushrooms are taken out as they form. Take them entirely out and leave no broken pieces to decay in the bed. The building where they are grown should not have a temperature lower than 55 degrees, and not much higher than 65. Near a city where there is a demand for mushrooms they may be made quite profitable.

OKRA.

This is a common vegetable for soups in Southern gardens, as gumbo soup is a popular dish. The crop is grown for market to a limited extent, but is of minor importance. Many varieties have been offered by seedsmen, and a few years ago we tested several varieties from Algiers, from seed collected by the Department of Agriculture, but none of them proved of any value here compared with the

White Velvet.—This variety has been long grown in the South, but has only in recent years been introduced to the seed trade of the Northern States. The pods are long and smooth and of a very light greenish color. It is so far superior to all others tried that we can see no need for describing other sorts. It is taller in growth than the Dwarf okra, but begins to bear early and is very productive, while its freedom from the stinging hairs on the green-podded sorts is a great advantage to the one gathering the pods.

ONIONS.

There is no vegetable more generally grown, both in market and private gardens, than the onion. While the onion will thrive in good culture on almost any soil, if well enriched, it is at its best only in a mellow soil inclining to sand. Well-drained, swampy land, like the black swamp land of our eastern coast, is pre-eminently the onion land in the North and West, where the culture of onions is carried on on a large scale. But for the early green crop to go to market, in February, March and April, the warmest sandy soil at hand is the best, since in such a dry soil the sets will winter better than in low ground or on a clay soil. It was formerly the notion that good, ripe onions could not be grown in one season from the seed anywhere south of the Potomac, and hence, formerly, all onions were grown in the South from sets or from top "buttons." Now we have found that by early planting it is as easy to grow fine ripe onions in the South as elsewhere, and sets are now used only for the production of early onions, for bunching green in the early spring and for the growing of the Potato onions, which increase only by bulbs and never make seed. The different purposes for which onions are grown necessitates different methods of cropping. We will, therefore, speak of these in detail.

EARLY GREEN ONIONS.

To produce the crop of early onions for bunching and shipping in a green state, in the early spring, we use seed of the Early White Queen, which is also, but erroneously, called Pearl. This is a different onion from the one usually catalogued as New Queen, and is finer and of a larger size and one of the mildest of onions. The seed is sown in April in soil of fair fertility, but not heavily enriched. The soil is made very fine and the seed sown very thickly in rows, using fully 50 pounds of seed to an acre, the object being to crowd the young seedlings, so as to produce a great quantity of sets, no larger than a small marble when mature. The seed bed must be kept scrupulously clean and the sets will be ripe in July. They are then lifted and cured with the tops on them and are stored in this way in a cool, dry place. They begin to sprout very quickly after the tops are removed, but with the tops on they lie lightly and keep far better. These sets are cleaned and planted early in September for the spring crop. The soil in which they are planted should be clean and very mellow. I prefer to use commercial fertilizer only for the onion crop, as there will be less trouble from weeds. Hard-wood ashes, spread broadcast, are also excellent. Onions are one of the few crops in which it is more profitable, and economical as well, to use the fertilizer in the furrow, under the rows. Having prepared the soil in the most thorough manner, I would use about 700 to 1,000 pounds per acre of the following mixture to make a ton:

Acid Phosphate	900 pounds.
Cotton-seed Meal	600 pounds.
Nitrate of Soda	100 pounds.
Muriate of Potash	400 pounds.

Run out furrows wide enough apart to admit of mule culture, or in gardens with the wheel cultivator. In the furrow scatter the fertilizer, and throw a furrow from each side, making a ridge over the row. Flatten this slightly and draw shallow furrows on the bed thus made. Plant the sets deeply, so that they will rest on the general level surface of the ground when the earth is pulled from the rows in the spring, and cover them. We set them thus deeply in the beds as a winter protection. They are merely kept free from weeds in the fall. After the severe cold we are apt to have about the middle of February, draw the soil from the rows, so as to leave the onion on the surface to bulb, and they will shortly be large enough to bunch. They are tied in bunches with strings of raffia fibre, the number in a bunch varying as the onions grow larger, all being bunched and sold by the time they are half grown. This crop is useless for ripe onions, since, if left to ripen, a large part of them will run to seed and spoil.

Sets of Yellow and White Potato onions can be used for the same purpose, and are planted in the same way, but the Queen is far superior for this crop. The Yellow Potato onion sets will make a fine early ripe crop if sold as soon as ripe, in late June, but they must be disposed of early, as they will not keep and are only in demand when the market is bare of ripe onions, before the Northern crop comes in.

GROWING ONIONS FOR THE RIPE CROP.

There are two ways in which this can be done. First, by sowing seed in the open ground very early in the season, and secondly, by sowing seeds in frames under glass in January and transplanting them later to the open ground when about the size of a lead pencil. The transplanting method is of value only with the Italian and Spanish varieties, which, in this way, can be made to grow to a very large size. The American varieties, which are the only ones that can be grown here to keep without sprouting, should always be sown where the crop is to be grown. The time for sowing will vary in different parts of the State. In the eastern section as early in February as the soil can be worked to advantage, and westwardly just as early as the soil is in the same proper condition. I prepare the soil just as for the fall crop of sets, but in this case rake the beds down nearly level after putting the fertilizer in. Then, with a garden-seed drill, drill the seed in on the beds. The fertilizer will then be right under them, and as onion roots do not ramble far the fertilization in the furrow is sufficient. There is no crop grown in gardens that requires more careful preparation of the soil or more thorough and constant cultivation. As soon as the young plants are well established they should be thinned to stand fully three inches apart, and the cultivation should be rapid and shallow, and all weeds must be removed from the rows by hand. The man who grows onions must get down to it, for they will not tolerate weeds nor laziness. As the bulbs begin to form the soil must be pulled away from them, so as to leave the bulbs on top of the ground. When the tops turn yellow and ripen the onions are pulled and left in heaps to cure, but must not be exposed to rain. The best place for the final curing is a loft of a barn or outbuilding, near the roof, where it is very hot. Spread them out in such a place, leaving the tops on. When the tops are dry, and the onions fairly cured, they can be removed to a cooler place in a basement, if dry, and spread rather thinly, still leaving the tops on, for they should never be removed till the onions are to be used or sold, as they keep far better with the tops on. Slight freezing in winter will not hurt them if not handled when frozen, and a cold place is better than a warm one. I have kept onions all winter on an open barn floor without a sprout showing, and sold them in the spring.

For this crop we have tested a great many varieties and find that the following are the best:

Southport White Globe.—This is a handsome white onion, almost as round as a baseball, very solid and one of the best, if not the very best, keepers of the white onions.

Yellow Globe Danvers.—This is a very large and fine onion of a pale yellow color. It is a good keeper, but in our experience not so good as the first named. The globe onions always measure up better than the flat ones, and hence make larger crops.

Tait's New Opal.—This is the best keeper of all onions. Grown in a cooler climate, it has been kept for two years sound. It is similar in color to the Yellow Globe Danvers, but slightly flatter in shape. For a ripe market onion it is hard to excel.

Large Red Wethersfield.—This is a large and dark red onion, very strong in flavor, but popular in the market, especially with those who want to take

them to sea for sailors' use. They are among the best of croppers and keepers, and make a crop with as much certainty as any.

Prizetaker.—This is the largest of all onions. Pale yellow in color and of a mild flavor. It has been grown to weigh four pounds, and while some consider it a good keeper, we have found it only moderately good for this purpose, as it sprouts with us easily in winter. It should always be grown by the transplanting method. I sow the seed in a cold frame in January and gradually harden them off and transplant to the permanent rows early in March. In strong, mellow soil, heavily fertilized, they will grow to an immense size. These are the great yellow onions frequently seen in boxes in the stores, imported from Spain, as it is a Spanish onion, but they have been grown in this State fully as large as the imported ones, particularly about Asheville, on mellow, rich bottom land, which suits the onion crop finely. Some seedsmen catalogue this as the Spanish King.

White and Red Bermuda.—These are frequently grown for early onions, either for bunching or for the early ripe market. Good crops of the ripe ones can be made in the same way as advised for the American varieties, and if the fall season is moist enough to get the seed well started the finest crops of green bunch onions can be made from these by sowing the seed the last of August or early September and getting them large enough to winter well. The seed used in Bermuda are said to be grown in Teneriffe.

The growing of sets of the Early Queen for sale can be made a profitable part of the business here, for there is always a brisk demand for the sets, and most of the sets used here are brought from the North, being largely grown in New Jersey and New York State by those who make a business of growing sets only. There is no reason why the crop should not be as profitable here as there, if the right seed are used. The bottom lands in the mountain section and elsewhere, and the black, peaty soils of the coast country will make the finest of lands for the ripe onion crop, and in any section early sowing of the seed in well-enriched soil will produce the crop the same season from the seed, and a far better crop than can be made from sets. It may be remarked here that while we have said nothing about the long series of Italian onions listed in the catalogues, any of these can be grown in the same way advised for the Prizetaker, but all are poor keepers.

PARSLEY.

This is of no particular value in the South as a market-garden crop, but every garden needs a bed of parsley for garnishing. For winter use we sow in the fall in a cold frame along with lettuce, using seed of the Moss Curled variety, and in spring we sow a bed as early as possible in rows, wide enough for cultivation. Later in the season we select a few plants of the best curled ones, from which to save seed for the following season. Parsley is quite hardy, and fall-sown plants will winter well, but the foliage is far more handsome when grown under protection. We grow mint in the same way in frames for early use.

PARSNIP.

The parsnip is seldom grown for shipping in the South, and is in little demand in the home markets, largely because it is seldom seen. Failure with the parsnip in the South is largely due to following the directions of the books for the North. The books generally advise the sowing of parsnip and salsify

seed among the earliest things planted in the garden, mainly because they are very hardy. But sown here very early in the spring, both of these are apt to run to seed and get woody and worthless about midsummer. Hence we always defer the sowing till late June, both of parsnip and salsify, as they then make their best growth during the late fall in cooler and more suitable weather, and both will grow more or less all winter through. We have made good salsify sown as late as last of July, and as neither of these roots are wanted till winter, it is useless to sow them early. These roots need a deep soil, deeply worked, and should not have stable manure freshly applied to them, as this is apt to make the roots grow forked. They can well follow a crop of early cabbages which has been well manured. The best variety, and, in fact, the only one commonly cultivated is the

Hollow Crown.—A selection from this called the Student is, perhaps, the best strain of the Hollow Crown parsnip, and of salsify the Sandwich Islands is the best.

PEAS.

English or garden peas are very largely grown in the South for Northern shipment, and the crop is one in which earliness is of the greatest importance. Hence there is a difference between the peas that will be grown by the trucker and those desirable in the family garden. The market gardener wants a pea that is early, productive and gives its entire crop at once, so that the whole can be shipped while the price is good. Quality is of secondary importance to him. On the other hand, the private gardener, while wanting to be in among the earliest, wants a pea of fine quality and one that will not throw its entire crop on him at once, but will continue to supply the table for a time, till a succession variety comes in. Every seedsman has his special extra early pea, but they differ from each other usually only in the care with which the seed stock has been grown and rogued free from inferior types, for nearly all the extra earlies are merely selections from the old Kentish type, or Daniel O'Rourke, and a well-grown stock of Daniel O'Rourke is as good as any of the type. There is another type of extra early peas distinguished from the Daniel O'Rourke type by the small round and greenish color of the peas. These, of which Tait's Nonpareil may be taken as the type, have been in our trials the earliest in cultivation and better in table quality than the Daniel O'Rourke type.

The soil for peas should be moderately fertile and light and warm. Fresh stable manure should not be used, as it tends more to a rank growth of vine than for fruitfulness. Still, though the garden pea is a legume, and forms nodules on its roots which acquire nitrogen from the air, it is of advantage to give the crop some nitrogenous fertilizer to encourage an early growth. A fertilizer with a moderate percentage of nitrogen and full percentage of phosphoric acid and potash is best for the crop, and 300 pounds per acre in the furrows is sufficient. In the field culture no support is used for the vines, except for the tall-growing Marrowfats, which are commonly planted alongside the dead stalks in a cotton field, and though planted much earlier than the extra earlies, come into market later, and sell by reason of their quality.

From one to one and a half bushels of seed are used per acre in field culture, as the peas are scattered quite thickly in broad rows, so as to stand up better and give a larger crop. The rows should be about three feet apart, and the sowing is done as soon after New Year's day as the ground can be worked

in good condition. In the colder sections of the State the sowing must, of course, be deferred till February or March. In the private garden a few of the extra earlies should be sown, as the wrinkled peas of higher quality are apt to rot in the ground if sown too early. We usually plant some extra earlies in our home garden in January, and in February follow with the wrinkled peas that will come in succession one after the other, sown at the same time, and as late as the first of April we make a third planting of some quick-growing dwarf pea, to complete the season. Good crops of the wrinkled dwarf peas, like the Premium Gem, can be made by sowing the last of August in a moist soil, planting the peas in a deep furrow and working the soil to them as they grow, and then cultivating flat, so as to preserve the moisture. If the fall is dry and hot the mildew may make the crop a failure, but in a favorable season the fall crop just before frost may be made quite a profitable one, and the vines may be plowed under on the land where the early cabbage crop is to be set later. We have never failed to make a good fall crop sown in late August, but failed when later sowing was attempted in the dry weather we usually have in September. For a late crop, then, always take advantage of the late August rains.

MARKET PEAS.

First of All, Earliest of All, and sundry other special names are, as we have said, all special selections from the

Daniel O'Rourke.—This represents an old and fixed type of early garden peas, and the various stocks of the seedsmen vary only with the care devoted to the keeping of them pure and free from rogues or sports, that is, plants that break away from the type into a ranker and later growth.

Extra Early Nonpareil.—This is the best and earliest of the greenish-seeded type, and the stock we have used is one of remarkable purity. In a row of these we grew the present season a line stretched along the top would touch every plant in the row at the top, showing a very uniform growth.

Extra Early Despot.—This is similar but not quite as early as the Nonpareil. The two last varieties have been especially recommended for the fall crop, but we have found that some of the wrinkled sorts not commonly grown in spring by market gardeners give a good fall crop, the Premium Gem and Heroine especially.

Alaska.—This is an extra early pea, of better table quality than most of the extra earlies, and has of late years been largely planted. There are some very poor strains on the market, and in getting the Alaska growers should deal with the most reliable parties who will guarantee their stock pure.

Tom Thumb.—This is an extra early and very dwarf-growing pea, as the vines rarely exceed eight or nine inches in height, thus allowing it to be grown in very close rows or between other crops that require the whole ground later. It is also grown largely for the canning factories, as it is a profuse cropper.

Improved White Marrowfat.—A great improvement on the old White Marrowfat, and earlier than the Black Eye Marrowfat. It is a tall-growing pea and needs some support. The seed are sown in November in the eastern part of the State, and commonly in a cotton field alongside the dead stalks for a support. Being later, they come in after the extra earlies planted in January. They are very hardy, but are sometimes injured in severe winters and are not so largely grown as the extra early peas.

PEAS FOR THE HOME GARDEN.

For the home garden and the home market we need peas of a higher table quality than the extra earlies. While we usually plant a few of these in January, and often have good success with them sown at that time, early planting is not always certain if severe weather follows. Hence, while planting a few, we make the main planting here in February and March. In any section of the State the garden peas should be among the earliest things planted, as moderate freezing after they are well started seldom does any harm.

Harbinger.—This is a new pea which we have grown for the first time this year. It is a very dwarf pea. Our plants, in rich soil, did not average over six inches high, but were loaded with large pods of fine peas. It is a fine early pea for small gardens, as the rows may be made but a foot wide, and a large crop can be had from a small area. From a limited trial, we are very much impressed with the value of this pea for the home garden.

McLean's Premium Gem.—This is one of the standard wrinkled peas, growing from twelve to fifteen inches high, and can be planted as early as any. We planted them in January last, and they came on at the same time as the extra earlies planted ten days later, as the weather checked the planting after we got these in. We have also found them the best for planting in late August for the fall crop.

Heroine.—This is a taller grower than the Gem, and a fine cropper, of very large pods of very large and fine quality peas.

Champion of England.—In quality the finest of peas, but a tall, rank grower. It gives a heavy crop and is still worth growing among all the new varieties that have been produced. It will grow over four feet tall, and of course must be supported. Of this we will speak later.

Yorkshire Hero.—This is our favorite among the wrinkled peas. It is earlier than Champion of England and comes in nicely between the Premium Gem and the Champion, planted at the same time.

Edible Podded Sugar Pea.—There are several varieties of these, all very similar in our experience. They differ from other peas in the fact that the whole pod is cooked like snap beans. They are tall growers and, in our experience, rather poor croppers.

In the home garden we give support to all peas except the Tom Thumb and Harbinger. Even the Premium Gem is better for being kept erect. We use for this purpose the wire netting now so commonly sold in the hardware stores. For the Gem we use netting only a foot wide, and for taller peas vary it with the height of the vines. The netting is tied to stakes stuck along the rows as soon as the peas show signs of running, and adds greatly to the neatness of the garden and is by far the cheapest support that can be had. We have netting that has been in use for fourteen years and still seems as good as new. In one experiment we put the netting to part of the rows, and for the others sent a wagon to the woods and had the old-fashioned pea-brush cut for the remainder. Keeping an accurate account of the cost of men and team, we found that the pea-brush cost more than the netting and was unsightly and useful but for one season. When the peas no longer need the netting it is either rolled up and stored or some of it is used for the running beans, like the Limas, or for tomato plants. A lot of this netting of various widths comes in very handy in a garden all summer.

PEPPER.

The only peppers grown to any extent for market purposes are the large ones of the Bull Nose type, which are used for making the stuffed Mango pickles. They are more largely grown by those who supply the pickle factories than by the market gardeners proper. Not much attention is given to getting them very early, as they are wanted in the green state in the fall. The seed are sown in a frame in March, or in the open ground in April, and transplanted when large enough to their permanent location in rows three feet apart and two feet in the row, and are cultivated just as the farmers do cotton. They need a strong soil, and agree well with liberal manuring.

Bell or Bull Nose.—This is still the favorite with those who grow for the picklers, though of smaller size than some of the newer ones. It is fleshy and of mild flavor.

Ruby King.—This is much larger than the Bull Nose, and its fine appearance will recommend it to the market grower and the home garden. It is usually of very mild flavor, but last year we planted it in a row alongside the Tabasco and the hot little peppers seemed to affect it and the pickles were unusually hot. We advise keeping it away from the very hot varieties, as the crossing of the blossoms will certainly affect the quality.

Mammoth Chinese.—This is the largest of all peppers, but so far, in our experience, is a poorer grower and cropper than the Ruby King, which is large enough for any. Its shape is better, being broader than Ruby King, and we are now trying to cross the two to get an intermediate type.

Tabasco.—Where a pepper is wanted for pepper sauce this is the one to grow. It is enormously productive of little pods about an inch long. The plants in good soil will grow six feet high and should be planted two feet at least in the row and three to four feet between the rows. There is nothing hotter in the pepper tribe. It is a variety of the Small Chili.

POTATO (IRISH).

There is no truck crop of more importance and more largely grown in the South than the Irish potato. The production of early potatoes for the Northern market probably occupies more space and attention in the market gardens than any other early crop, except, perhaps, the early cabbage. Like all the early market crops, the potato has had its fluctuations, in some seasons being so plentiful and low as to hardly pay for the digging, and then perhaps the very next season being in great demand at very remunerative prices. Seasons when any particular market crop fails to pay well, it is very apt to be the case that that particular crop will pay well the next season, because the growers of inferior products who have glutted the market will be discouraged and leave the crop to those who keep at their business in a uniform manner and never lose their heads. The gardener who regularly plants his uniform area is always more likely to succeed than the one who rushes in and out of any particular crop, as it may pay or not in a particular season.

As with other early crops, the early potato crop thrives best on a light and warm soil, and is always better on a soil well filled with vegetable decay. Hence, as a preparatory crop for the potato crop, there is nothing better than the cowpea of the South. A heavy growth of pea vines allowed to die on the land and remain during the winter for plowing under for the potatoes will insure freedom of the crop from scab, as the decaying mass will produce

an acidity inimical to the scab fungus. Then, if the crop is liberally supplied with commercial fertilizer suited to it, very heavy crops of clean, smooth potatoes may be grown. There are few sections in the whole country which produce larger crops of Irish potatoes than the coast country of Eastern North Carolina. Heavy fertilization of the soil is needed for the best results in early vegetables, and the potato is no exception to this rule. We have often heard people say that their gardens are too rich for Irish potatoes, and that they make great tops and small potatoes. The fact is, that these old gardens have, year after year, been supplied with stable manure, and the decay of the organic matter contained in this manure supplied the soil well with humus and nitrogen, while it is deficient in phosphoric acid and potash, which most garden crops use freely. There is nothing that so increases the productiveness of an old garden which has long had its annual dressing of stable manure than to change for a season or two to commercial fertilizers. The old garden soil fails to make potatoes, because there is in it an excess of nitrogenous matter in proportion to the mineral plant food it contains. Therefore, in such a garden a liberal application of acid phosphate and potash to the potato crop will work wonders in the crop, and while large vines may still be produced they will be accompanied by a similarly large crop of tubers, since the food for their production is at hand. On most of the land devoted to the production of the early potato crops by our truck growers heavy applications of a complete fertilizer have been found necessary and profitable. I have found the following a good fertilizer mixture for the early potato crop:

Acid Phosphate	1,000 pounds.
Dried Blood	500 pounds.
Nitrate of Soda	100 pounds.
Muriate of Potash	400 pounds.

Use from 700 to 1,000 pounds per acre, partly in the furrow and partly alongside the rows, after the potatoes start. In fact, all the nitrate of soda may be used in this way. Thorough preparation of the land is essential, and early planting. In the trucking section of the eastern part of the State the planting time is in February or early March, as the season permits, and in the western and colder sections as early as the condition of the soil will allow its preparation. We have tried fall planting here, but the results were too early starting and frosting of the tops. This, however, may happen even with spring planting, and it is worth while to test the late fall planting further, since the crop is very sensibly increased in earliness. I would suggest in this section of the State planting in December and covering six inches deep with pine straw, after covering the potatoes in the soil in the usual manner; then in spring remove the straw and cultivate the crop as usual. Potatoes treated in this way the present season were several weeks earlier than those planted in the spring, as the wet weather then delayed the planting beyond the usual time. Northern seed potatoes are now seldom used by the market growers of the South Atlantic States, since it has been found that potatoes grown here late in the fall from seed of the early crop make far better seed for the early planting than the Northern potatoes. They can be kept, too, for summer planting better than the Northern-grown potatoes, and for table use it is best to use the potatoes of the previous fall for planting in June and July, as they will produce a larger and more mature crop than the seed of the same season, since they start earlier.

THE EARLY CROP OF POTATOES.

The land should be thoroughly and deeply plowed, and harrowed fine. Lay off furrows two and a half to three feet apart, and scatter the fertilizer in the furrows and on both sides of the furrow. Lap two furrows over the first, and then open the beds again with the plow, and drop the potatoes, cut to two eyes, about a foot to fifteen inches apart, and throw two furrows over them. In this way the heavy application of fertilizer is well mixed in the soil and will not interfere with the growing of the potatoes. The crop can be much forwarded if, instead of planting so early that there will be danger that they will get above ground while frosts are imminent, they are spread in a place where they can be kept in the light and kept warm till they show sprouts before cutting. An unoccupied frame with glass sashes is a good place to sprout them. We planted some treated in this way this spring in the frames from which the lettuce had been cut, and had perfectly ripe potatoes the 14th of May. Of course, this is earlier than they could have been had in the open ground, and it may not pay as a market crop to grow potatoes in frames under glass, but for family use it is very nice to have a few well-matured potatoes in May. Another season I propose to test this on a larger scale, to prove the availability of such intensive culture for market purposes. So far as it went, my crop this spring was a remarkably fine one, and large potatoes that would not slip the skin in the middle of May ought to bring a fancy price. In the cultivation of the early potato crop, the cultivator should be used, after the smoothing harrow has been run over, just as the plants appear above ground, and the final working should be with the turning-plow, throwing earth to the rows, for at this early season the ridges get the warmth of the sun better than the flat surface. With late potatoes we prefer perfectly flat cultivation. Where one has a weeder there is nothing better for the early cultivation till the tops get six inches high. Then one working with the cultivator and hilling will finish the crop. The ridges made in covering the potatoes are, of course, harrowed down before the potatoes appear.

SECOND CROP POTATOES.

For growing the second crop for seed, let the potatoes get completely ripe and the tops dead. Dig and spread them in the light, but not in full sun, to green slightly; then cut the potatoes simply in halves; spread in a single layer on the ground in any convenient place and cover with pine straw. When they show sprouts, plant them. This will be about the first week in August. In planting these we prefer to make deep furrows and plant in land that has been well manured for some early crop. Cover lightly till the leaves appear, and then work the soil to them till level, and cultivate shallow and level to retain the moisture. Some plant the potatoes as they are dug, and this may do in the more level and moist soils of the eastern part of the State, but in our dry soil in the upland sections it is better to cut and sprout them. We cut before sprouting, as they sprout more readily after cutting than before. These potatoes grow till the frost kills the tops, and are dug so late and kept so short a time before planting again that they do not sprout in winter as the Northern potatoes do, so that when they grow it is with the strong terminal bud, and a stronger plant is the result.

LATE POTATOES FOR TABLE USE.

For growing a crop of well-matured late potatoes for table use we prefer to use the second crop seed of the previous year. These are kept in a cool, dark place till they begin to show signs of sprouting. They are then spread out in a single layer on a barn floor, in full light, so as to keep the sprouts short, and are planted in the same way and with the same fertilization as the early crop, and cultivated in the same way. The middle of June or the first week in July will be the proper time for the planting. This crop should be cultivated shallow, rapidly and perfectly level, and no hilling done, as the object then is to conserve the moisture in the soil. This crop will mature before frost, and will make the best of potatoes for winter use or the local market.

In the western mountain country of the State it might be well for the growers to get the second crop seed from the eastern part of the State for the late planting.

Varieties.

The varieties of potatoes are now almost innumerable, and new ones are being introduced annually. It is always well for a grower to test annually a few of the new ones, but for a crop he should always depend on the standard varieties which have long been grown and proved. With many growers the

Early Rose still maintains the place it won many years ago as the standard early potato. A selected variety grown at Houlton, Maine, known as the Houlton Rose, is highly esteemed. But other varieties are rapidly superseding the Rose with many growers.

Early Ohio.—This is similar in appearance to the Early Rose, but is rather earlier. It is a good, smooth and productive variety.

Bliss's Triumph.—This variety has largely superseded the Rose with many. It is a round potato with a red skin, and is very early and productive. A variety has been selected from it under the name of the White Skinned Bliss, which is now more largely grown than the red-skinned variety. With us it makes a good crop of uniformly good-sized potatoes, with very few small ones.

Maule's Early Thoroughbred.—Our experiments with this potato show that it is as early as any and remarkably productive. It is a large white oval-shaped potato, very smooth-skinned and with shallow eyes, lighter in color than the Early Rose and uniformly larger. In table quality it is among the best.

Junior Pride.—A round potato, similar to the White Skinned Bliss. Very productive, early and of good quality.

Freeman.—In quality and handsome appearance one of the best, but it has always been with us later than those mentioned above and very unproductive.

Early Bovee.—In our trial last year this was the leading early potato in crop. It is about the earliest in the lot, and is of good quality. It is a long oval potato with a pinkish skin, and is well worth testing by market growers.

Eureka.—This is the whitest and prettiest potato we ever grew. It is similar in shape to the Bliss, but far whiter than the White Bliss; in fact, the whitest of white potatoes. We are very much pleased with it from one trial this season. It was the Eureka which gave us ripe potatoes May 14th, when grown in a frame. For this purpose we expect to try it again. Its attractive appearance should make it a good seller.

Sir Walter Raleigh.—This is probably the best of the later varieties. It is a good cropper, and if kept in cold storage from the Northern-grown crop and planted here in June or July, will make a fine later crop.

We have tested other varieties, but the above are about the choice.

RADISHES.

When produced early the radish crop is of some importance to the market grower. It is one of the crops that we can profitably use glass sashes for in the early spring. Sown under glass in January or February in heavily fertilized soil, the early round and oval-shaped radishes can be made a fairly profitable crop, just as early beets may be under the same conditions. They need a light and warm soil and an abundance of nitrogenous fertilizer. The catalogues list numerous varieties, but for early use we have found nothing better than a good strain of the

French Breakfast.—This is an olive-shaped variety, of red color and early. But its defect is getting pithy as soon as of full size.

Tait's Favorite Forcing Radish.—This is probably the best for forcing for market in frames.

Long Scarlet Short Top.—This is more largely grown for market in the open ground than any other, but is not so good for frames as the short varieties. It makes long and handsome roots that bunch prettily and sell well.

Early radishes are often sown in the rows with beets to mark the rows early, as they come up quickly, and can be taken out by the time the beets need all the room.

WINTER RADISHES.

The only winter radish we have as yet found worth cultivating is the

Chinese Rose-colored Winter Radish.—This is, as the name indicates, a rose-colored radish. It grows to a large size and rather clubshaped, or larger below just above the stump-root, than at the top. It is a very hardy radish, and we here sow it in rows a foot apart in late September and October, the first sowing being for use up to Christmas. The October sowing is slightly protected with rough manure, and the radishes are pulled all through the winter till March. Those who are fond of radishes will find this among the best. In the colder section of the State they can be lifted and stored like turnips, in the fall.

Radishes of the early varieties are sometimes forced in winter in cool greenhouses, and where there is a market that demands such products at that time they may be made profitable. But they are so easily grown in all the warmer parts of the State in simple frames, like lettuce, that it would hardly pay here to use greenhouses for the purpose.

HORSE RADISH.

The horse radish is a native of Europe. It needs a deep and very rich soil, and good roots cannot be grown in a thin or poor soil. It is a crop that can be produced profitably for market if grown right. It is propagated by making cuttings of the roots about three inches long. These should be planted here in the fall. They can be set between the early cabbages by making deep holes with a crowbar and dropping the cuttings into these, taking care not to put

them upside down. They will make little growth till after the cabbages are off in the spring and can then be cultivated for the rest of the season, and the crop can be harvested in the fall and the roots trimmed for market and the new sets planted for another season. On good soil several tons per acre of the roots should be produced, and there is always an active demand for them.

SWEET POTATOES.

The sweet potato is generally regarded in the South more as a farm than a garden crop. It is a crop peculiarly adapted to the lighter soils and the Southern climate, and if the varieties popular in the North are grown the crop can be made a profitable one for Northern shipment. In the South we generally prefer the sweet and soft yam varieties, while in the North the dry Nansemond and similar sorts are preferred. Therefore, while we may not esteem these, if we are growing for market we must grow what the market wants. Every one in the South thinks he knows all about sweet potatoes, but we have seen a great deal of needless work applied to the crop, and a few hints in regard to the culture may not come amiss. This is one crop in which we have found shallow plowing an advantage, and shallow hilling, too. As frequently grown in the South with very high hills, the potatoes grow too long and misshapen. A sandy soil of but moderate fertility is best for the potato. We would prefer to plant on a pea stubble, which will give all the nitrogen needed by the crop, and in a better shape than in a readily available commercial fertilizer. Having such a stubble I would plow it early in the spring not over four inches deep. In the absence of a pea stubble cover the land over with rakings from a pine woods and turn it under in February, and then by repeated harrowings mix it well with the soil.

Producing the Plants.

In the North a hotbed is necessary for the production of the sprouts for setting, but here I prefer a simple cold frame covered with a glass sash. In this frame I place about three inches of sand, and on this place the potatoes just so as not to touch each other, and then cover with a couple of inches of clean sand, and put the glass on and keep it close till the sprouts appear, after which plenty of air must be given whenever the sun shines. Of course due attention must be given to the watering of the bed as needed. Some bed in rich soil, with heating manure, but I have found that there is far less danger of disease by bedding in sand, and the plants are better rooted. The best potatoes for bedding are produced by making cuttings of the vines in August and setting them closely in rows and cultivating as the general crop. These cuttings should be made of the tips of the vines and about a yard long. Coil the cutting around the hand and set the coil in the hill so that only the tip is above the ground. Every joint then will make a bunch of little potatoes, which will keep easily in winter, and be far better for bedding than small potatoes selected from the main crop. Cloth will answer to cover the plant bed, but the plants will not be so early as under glass.

Planting the Crop.

Run out furrows three feet apart, and in these furrows apply the fertilizer. If on a pea stubble or with a good dressing of woods trash, no ammoniated fertilizer will be needed, but in the absence of these a small percentage of ammonia is needed, and the ordinary 8-2-2 fertilizer sold for cotton will answer, though a larger percentage of potash will be better. When on a pea stubble or with a good application of leaf mold I would mix to make a ton 1,800 pounds of acid phosphate and 200 pounds of high-grade sulphate of potash, and would use of this about 400 pounds per acre in the furrows. After applying the fertilizer, draw the plants and set them as drawn in a tub of water, so that they can be set dripping. Throw a furrow from either side over the fertilized furrow and set the plants about fifteen inches apart in the rows, putting them deeply in the earth, so that only the tip is above the ground. Before doing this I should have said that the top of the ridge formed by the two furrows should be flattened. Cultivation with the ordinary small-tooth cultivator begins as soon as the plants have taken root, and is kept up till the vines run in the way. The last working is done by throwing the vines over into the adjoining space and plowing the earth to the plants in each alternate row. Then, throwing the vines back, plow out the other rows, and the work is done.

The Late Crop.

While the sets raised from the bedded potatoes are best for the early planting, the crop for keeping in the winter is better grown from cuttings. Make cuttings of the tips of the vines early in July and set them in rows just before a rain, in the same way as the early plants. They take root readily and the crop produced will be later and will keep far better in winter than that from the spring plants. Later, in August, as we have already suggested, long cuttings are made for the production of seed potatoes for the next spring's bedding.

Harvesting and Keeping Sweet Potatoes.

The crop for the early market is, of course, dug as soon as the tubers are of a marketable size, but the crop for winter keeping should be allowed to grow as long as the weather will permit. When frost has blackened the tops lose no time in getting the vines off, for if left after they are killed they will communicate a decay to the roots. Therefore, take off the tops at once, though digging may be deferred. Endeavor to dig the crop in dry and sunny weather. In taking them from the ground use every care to avoid bruising, and never allow the potatoes to be thrown in heaps, but let them lie in the sun along the rows as dug. Take them up in baskets or boxes, never in sacks or dumped into a wagon body, for the success in keeping depends largely on the care with which they are handled.

Sweet potatoes may be kept in this climate in heaps or banks if properly handled, but where a large crop is grown it will pay to build a regular potato house, which I will describe further on. If they are to be kept in banks a good supply of pine straw should be provided some time beforehand and put under cover, so as to have it perfectly dry. Select a high spot where no water can run to the heaps. Put down a layer of the pine straw a foot deep, and pile the potatoes carefully in conical heaps, not more than twenty-

five bushels in a heap. Then cover a foot deep with the pine straw and build a rough shed over the heaps. Let them remain in this way till they have passed through the sweat which they always have after storing. As the weather gets colder cover the heaps with dry soil, and later on increase its thickness. The roof over the heaps is important, for dry earth will keep out far more cold than wet earth. I have kept them in this way till June without loss.

But by far the best way to keep sweet potatoes is in a house made for the purpose. A tobacco barn with furnace and flues can be utilized in the absence of a regular potato house, by putting slatted shelving in it on which to place the potatoes, and then start the fire and keep up a temperature of 90 degrees till they have sweated and dried. After this, if care is taken that the temperature does not fall lower than 45 degrees, they will keep easily. The drying off at a high temperature when first stored is the important point.

A sweet potato house should be made about ten feet wide and as long as needed. The walls should be doubled and packed with dry sawdust, and the ceiling packed in the same way. A ventilator should be placed in the roof and the doors should be doubled and about six inches between them. Make a furnace at one end, like that in a tobacco barn, and take a flue straight through overhead. Make slatted shelves on each side on which to store the potatoes so that they need not be more than a foot deep on the shelves. Fire up to 90 degrees when first stored and dry off the potatoes completely, keeping the ventilator open slightly to let the vapor pass off. When dry, close up and keep cool and there will be little rotting if care is taken to start a little fire in very cold spells to keep the temperature up to 45 or 50 degrees. In such a house it is easy to keep potatoes till the new crop comes in.

Varieties of Sweet Potatoes.

Nansemond.—This is the most popular yellow potato in the Northern markets. It is smooth and handsome and a fairly good cropper, but is too dry and lacks sweetness for the Southern taste.

Red Nose.—This is a yellow potato, somewhat similar to the Nansemond, but usually averages larger in size. It sells on the Northern markets as Nansemond, but is rather a heavier cropper.

Barbadoes.—There are two varieties known here as Barbadoes or "Bayduses," as they are commonly called. One has white flesh and one yellow. Both are of fine quality and have the soft sugary sweetness popular with the Southern people. In yield they are hardly equal to some others.

Norton Yam.—This is one of the dark yellow or pumpkin-colored class, similar to the Pumpkin Yam of Georgia. It is one of the most popular potatoes in this State, and is as largely grown as any other. We have seen it sporting into a bush form, and by proper selection a vineless variety could be easily produced.

Vineless Yam.—This is distinguished by the tops of the plants assuming a bush-like form instead of running flat on the ground. From a single season, in growing it, I have not formed a very favorable opinion of its quality.

Jewell Yam.—This is a local variety, grown to some extent in Wake County. It is a long yellow-bark potato, intermediate between the yellow Nansemond and the yam class. It is sweet and good and a good cropper.

Negro Choker.—This is a long-growing potato, with a purplish red skin and snow-white flesh. It belongs to the dry class and would suit the Northern taste. It is a good cropper and would probably take well North, but is too dry for the home market.

Peabody.—This is probably the largest potato and heaviest cropper grown. Dug when half grown it may pay for the early market. It has yellow flesh and a pink skin. When fully grown it is almost worthless for the table, but is valuable as a food for hogs to gather for themselves. No other potato will make as many bushels per acre.

Southern Queen or Hayman.—This is a large, roundish potato, which was brought by Captain Hayman to North Carolina from Brazil, and which was later brought out by a New York seedsman under the name of Southern Queen. It is the earliest sweet potato grown, and the easiest one to keep in winter, as it will keep well in any ordinary dry cellar. Next to the Peabody, it is the heaviest cropper. Its faults are a tendency to grow too large, and in quality it is intermediate between the yam class and the Nansemond class. It is common in the Northern markets under the name of yam. The flesh is yellow and the skin is lighter colored. It will make a better crop on clay loam than most other potatoes.

Little has been done in the way of growing improved varieties of the sweet potato. Some years ago we grew from seed brought from Florida, for while some varieties bloom here we have never seen any seed perfected in this climate. Unfortunately, our crop from these seeds was lost in the following winter by dry rot, and we have never had an opportunity to try the seed again. The sweet potato is a member of the morning glory family, and grows easily from the seed when they can be procured, and it would seem that in some of the tropical islands we now possess seed could be produced that would give us improved varieties, and we hope that the new Experiment Stations started in Porto Rico and elsewhere will give some attention to this crop.

SALSIFY.

This is a hardy, tap-rooted plant of the composite order, commonly known as vegetable oyster plant, as the roots when boiled and mashed and fried in batter very closely resemble fried oysters. As salsify makes a long tap root it is essential that it have a deep and mellow soil. In the North it is one of the earliest vegetables planted, but in the South, if planted early, it is apt to run to seed at midsummer and to get woody and worthless. Since it will grow all through our winters, early sowing is not necessary, and the best time to sow the seed is about the first of July. The seed germinate poorly in a loose soil, and hence should be sown rather thickly and the row tramped over after sowing. When a good stand is had the plants can be thinned to about three inches apart, and should be worked clean and rapidly and perfectly level. No protection is needed in winter, as the plants will make their best growth here during December.

The only variety worth growing is the one known as Sandwich Island. For market the roots must be trimmed and washed and tied in bunches of half a dozen or more, using one tie around the tops, which should be shortened, and another around the ends of the roots.

SPINACH.

This plant is very largely grown by Southern market gardeners, especially about Norfolk, Va., for a winter greens, and hundreds of acres are annually devoted to it. In hard winters, when the crop North is apt to be killed, the Southern crop pays well, but often the price is very low. The crop needs a fertile soil or one that has been heavily fertilized for a summer crop. Sow the seeds rather thickly in rows far enough apart for cultivation early in September or late in August, and make another sowing about the first of October. A fertilizer high in ammonia is best for this crop.

There are a number of varieties, and the books by Northern writers always advise the sowing of the prickly-seeded sort in the fall and the smooth-seeded in the spring, while market gardeners invariably do the reverse, and, in fact, seldom sow any but the smooth-seeded sorts. The best of these and the only variety I use is Tait's Improved Curled Savoy.

SQUASH.

Summer squashes are commonly called cymblings in the South. They are grown in the same way as cucumbers and muskmelons. The Bush Pattypan is the variety commonly used, but there are a number of others, and the Summer Crookneck is of better quality for home use than the Pattypan, but not so good for market, as it does not crate easily. There are a number of winter varieties which are but little grown in the South. In the North they are baked and take the place of our sweet potato, but here the sweet potato can entirely take the place of the winter squash.

TOMATO.

No vegetable is more largely grown in summer than the tomato, and none has received more attention from the plant improver. Hence the varieties are almost endless, and new ones are continually being introduced. The tomato is so easily bred into better shape and so quickly deteriorates from neglect, that many of the varieties that have been in the catalogues for many years are no longer what they were, but have either been selected into better shapes or allowed to deteriorate. The crop is now very largely grown as a field crop by farmers in Maryland and elsewhere in the Middle States for the canning factories. As a market crop the profit depends on the getting of the crop early, for only the earliest will pay for shipment from the South. Therefore, especial pains must be taken in forwarding the plants for setting. Every market gardener should have at least a small greenhouse and plenty of frames covered with sashes. These are indispensable in getting an early crop of tomatoes, for plants sown thickly in a hotbed and transplanted directly to the field are seldom any earlier than plants grown from seed in the open ground. The seed should be sown in the greenhouse in shallow boxes or flats, about ten weeks before it will be safe to plant in the field in the locality. As soon as the plants are well up we transplant them to other boxes and give them about two inches space each way. They are then kept in a house that has a temperature of about 45 degrees at night, so as to grow slowly. By the first week in March they can be transplanted to the cold frames and set about four or five inches apart each way for hardening off. If very cold

weather should occur after they are in the frames the glass should be protected at night with straw mats. Air should be given in the frames at every opportunity, and the plants gradually inured to the open air, and finally the glass should be left off at night before setting them. This method will give stout and hardy plants, and the earlier they can be gotten into the field and live the earlier the crop will be. In this locality we can usually set them the last of the first week in April. The plants are lifted from the frames with a garden trowel and carried in flats to the field with the mass of earth adhering to the roots. If the soil is dry we pour water in the holes, set the plant and pull dry earth around the roots, and in this way seldom have a plant wilt. In field culture we set the plants four feet apart each way and merely cultivate clean and let them grow as they will and tumble on the ground. In garden culture we plant in rows four feet apart and set the plants two feet apart in the rows, and place a strong stake to each, to which it is trained with a single stem and all side shoots kept nipped off. This gives the earliest crop, but not so large a one as where the plants grow at will. In this part of the State the growing of tomatoes is far more difficult than in the western section or northward. The early plants are usually exhausted by the last of July, and hence the need for growing a second crop to follow these. For this crop we sow seed in the open ground about the last of May and transplant then in spots where some early crop has been taken off. These plants will furnish fruit till frost. When frost nips the vines we gather all the green tomatoes and wrap each one separately in old newspaper, pack them in crates and put into a cool, dark basement or cellar. We try to keep them as cool as practicable not to be in danger of freezing, and bring a few into a warm room at a time to ripen up. In this way we have tomatoes for slicing till after Christmas.

The great difficulty in the growing of tomatoes here is the bacterial wilt disease, which takes off the plants suddenly when just full of green fruit. We have found that an application of lime to the land will temporarily check the disease, but the best thing that can be done is to avoid repeating the crop on the same land for several years. It is well also to sterilize the soil used in the seed boxes by heating it, before filling the boxes, to about 200 degrees. Spraying with the Bordeaux mixture will have little or no influence on this Southern blight, as it is called, but the spraying should be done while the plants are in the frames, and after they are set out, at intervals till the fruit is half grown. This is used as a preventive of the rotting of the fruit.

Varieties of Tomatoes.

These are now so numerous that a complete list of the varieties offered by the seedsmen would tend more to confuse the inexperienced gardener than to help him. Therefore we give merely a selected list, which we have tested and approved more or less. The rule that increase of size in fruits is always accompanied by a decrease in number of fruits holds good with the tomato. The little currant, cherry and plum-shaped tomatoes produce a greater number of fruits than the larger ones. Hence we have found that for general purposes a fairly medium-sized tomato is more satisfactory than an enormously large one. This is true, not only for those used at home, but for the crop intended for market or canning. The canning houses do not want the over-

large tomatoes and the buyer in the city market will take the smooth, medium-sized ones in preference to extra large ones. It is found that the small pear and plum-shaped tomatoes resist the Southern bacterial blight, and it is to be hoped that through crossing these with the larger sorts we may develop a variety of good quality that will be resistant. A tomato that is early, of good, smooth character and productive is the great desideratum for the Southern market grower. Most of the early varieties have been defective in shape, or hollow and otherwise objectionable. If the following variety comes up to the claims made for it by Messrs. George Tait & Sons of Norfolk, Va., who introduced it this season, it will be a valuable variety for the South. This is

Hawkins' Sunrise.—This tomato has been produced by a Norfolk truck grower, and with him has for two years beaten every other variety shipped from Norfolk. It is a brilliant red tomato, very thick and symmetrical, and beautifully smooth from first to last. Its greatest claims are its extraordinary combination of size with earliness, and its apparent exemption from disease. We have not yet grown this variety, but give the description of the introducers, in whose statements we have confidence, and believe it worthy of trial by our market growers.

Sparks' Earliana.—This has of late been one of the leading extra early varieties, but the first named is claimed to be larger and of better quality, and fully as early. Earliana is certainly one of the earliest we have tried, but in quality is not first class.

Maule's Earliest.—This is about as early as any, and is the most prolific tomato we have ever grown. It is bright red in color and of large size. Its fault is that many of the fruits come very distorted in shape. If it can be bred into a smooth shape there will be little left to desire in an extra early tomato. If Hawkins' Sunrise is all that is claimed for it, it will probably become the standard early tomato in the South.

Beauty.—This is one of the best of the many tomatoes produced by the late Mr. Livingston of Ohio. It is large, solid and smooth, and of a rich, reddish purple color. Of late it has been more subject to disease than others, and is declining in popularity. Where it thrives there are few better tomatoes.

Success.—This tomato, introduced by W. H. Maule of Philadelphia, we have found the best main crop tomato we have ever grown. Its brilliant red color, solidity and smoothness, combined with great productiveness and a size large enough for general purposes, have made it a favorite with us and with all who have grown it. We regard it as the standard tomato of to-day for the general crop.

Ponderosa.—Probably the largest tomato grown. It is very solid and of good quality, but entirely too large and unproductive for general use. Its value is mainly for the production of a few immense fruits for exhibition. It often comes in a very rough shape, though generally rather smooth. It is more of a curiosity than a general cropper.

Of course there are many other varieties of tomatoes listed in the catalogues. Most of the extra early ones are defective in shape and solidity, and are rapidly being dropped by growers, and many of the later ones, while large and heavy, are of irregular shape. Therefore, we have endeavored to give a list of a few that are the most promising. Tomatoes can, of course, be grown well with commercial fertilizers, but we have found that a combination of stable manure broadcast with a little high-grade fertilizer applied around the plants, after setting, will give better results. Where only fertilizers are

used the crop deteriorates more rapidly as the season advances, and lasts a shorter time. With a broadcast application of stable manure we have had the early plants to run through the entire season, while they always fail soon after midsummer with fertilizers alone. An application of nitrate of soda around the plants when the fruit first forms is a decided advantage to the crop. The tomato is one of the crops which the Southern grower should always devote attention to saving seed from for his own use. Care in the selection of seed can be made the means of greatly improving the crop in quality and earliness. If a plant is found of remarkably good qualities among a lot of others not so good, do not save seed from it at once, but make cuttings of it and root them in the greenhouse and carry over winter, just as geraniums and other flowering plants, and increase the number, so that in the spring you may have a number of plants of this identical tomato, which can be planted away from other sorts, and from which you can save seed with some certainty of getting the same sort. Then a few years' selection will enable you to establish it as a variety that will come true to type from seed.

TURNIPS.

Turnips are more of a farm crop in the South than a garden crop. But in some seasons the sowing of the Purple Top Strap Leaf turnip in the early spring for shipment North will prove profitable. In past years I have made this spring crop quite profitable by using a piece of light sandy soil and giving a heavy application of high-grade fertilizer rich in nitrogen or ammonia. Harrow this in well and sow the seed broadcast thinly. The crop is quickly grown, and I have at times received $3 per barrel for them in the spring. For this crop it is probable that the newer variety known as the Extra Early White Milan or the Purple Top Milan will be better than the Old Purple Top Strap Leaved, as it grows as quickly as a radish. The Seven Top turnip is popular in the South for greens, as it grows well all winter and furnishes an abundance of sprouts for boiling. The larger turnips are mainly of use to the farmer and stock grower. The extra early varieties can be sown here as late as October and make a crop. For family use in winter, we have found the Long White French turnip best. It is a long tap-rooted variety, near akin to the ruta-baga. The seed should be sown early in August for the best results, and as it is perfectly hardy it can be left where it grows all winter and seldom becomes pithy. In the colder parts of the State it is best to plow a furrow to each side of the rows late in the fall as a protection. It is the sweetest turnip we have ever grown, but needs a longer season than others.

PACKING AND SHIPPING VEGETABLES.

It is of the greatest importance that the products of the market garden should be put into an attractive shape for market. Green onions, beets and other crops that are sold in bunches should be properly washed and neatly tied in bunches with strings of raffia and packed in barrels. Asparagus must be bunched in the regular buncher and the bunches made of the regulation size. Asparagus is shipped in flat crates, just high enough to admit of the bunches being stood on end on a layer of damp moss and covered with another layer, the bunches being set in so closely that they cannot jostle and get out of place. Cabbages are shipped in barrel crates with a partition in the mid-

dle. Beans and peas and lettuce in bushel baskets with a cover held tight with wire hooks. If lettuce is grown of fine quality under glass it will pay to ship in the Southern carriers holding about two dozen heads. These will sell in direct competition with the hothouse lettuce of the North, and will bring more money than lettuce grown under cloth and shipped in baskets or barrels. A neat and attractive package always pays, and an honestly packed package will always tend to make a reputation for the grower, while a poorly culled sample and dishonest packing will always give the grower a bad name and a lower price for his articles. Never ship culls of any sort unless the market is very high and culls can be shipped as culls and pay. Muskmelons are shipped in crates, and they, too, should be rigidly culled and no overripe or green specimens sent. The grower who always sends a good article, well packed in neat packages, will always make better prices than the man who tries to work off an inferior article by hiding it in a package, surrounded by good specimens, for the only man he cheats will be himself with this last sort of packing. Always ship to a commission merchant who has made a reputation for fair dealing, and who has a good bank standing, rather than an unknown party. While there are rogues in the commission business, there are honorable and responsible men, and these you should find out and stick to.

FIRST REPORT ON CONCENTRATED FEEDING STUFFS AND COTTON-SEED MEAL.

By B. W. Kilgore, C. D. Harris, J. M. Pickel, F. C. Lamb.

Concentrated feeding stuffs are as much subject to adulteration as are commercial fertilizers. At the present time they are adulterated with materials having but little feeding value, such the chaff of the grains, oat hulls, peanut hulls, etc., to a greater extent than commercial fertilizers. They are used very largely for feeding domestic animals, particularly milk cows, of which there are about 250,000 in the State. The feeding value of these products depends on their composition and may be varied by the use of the materials referred to above, so as to change their value as feeds to a very marked extent. To prevent such adulteration and to require manufacturers to guarantee and keep their products up to a certain standard, the General Assembly of 1903 passed laws regulating the manufacture and sale of concentrated commercial feeding stuffs and cotton-seed meal. These laws went into effect on July 1st of this year, and are reproduced in full below for the information and benefit of those who are interested in them:

AN ACT TO REGULATE THE SALE OF CONCENTRATED COMMERCIAL FEEDING STUFFS.

The General Assembly of North Carolina do enact:

Section 1. That every lot or parcel of concentrated commercial feeding stuff, as defined in section three of this act, used for feeding domestic animals or poultry, sold, offered or exposed for sale within this State, shall have affixed thereto, or printed on the bag or other package, in a conspicuous place on the outside thereof, a legible and plainly printed statement, clearly and truly certifying the number of net pounds of feeding stuff contained therein, the name, brand or trade-mark under which the article is sold, the name and address of the manufacturer, importer or jobber, and a statement of the maximum percentage it contains of crude fiber, and the minimum percentage of crude fat and of crude protein, allowing one per cent of nitrogen to equal six and one-fourth per cent of protein, all three constituents to be determined by the methods in use at the time by the Association of Agricultural Chemists of the United States.

Sec. 2. The term "concentrated commercial feeding stuff," as herein used, shall not include hays and straws, the whole seeds, nor the unmixed meals made directly from the entire seed of wheat, rye, barley, oats, Indian corn, buckwheat, broom corn, sorghum, cow-peas or soja beans. Neither shall it include pure grains ground together, nor wheat bran or wheat middlings, not mixed with other substances, but sold separately as distinct articles of commerce, nor the by-product (not corn bran alone, but the bran, portions of the germ and grain mixed) from the grinding of corn for meal, grits or hominy, when said by-product shall come up to the standard adopted by the Board of Agriculture; but should the whole grains, the unmixed meals, grains ground together, wheat bran, wheat middlings, or corn by-product be adulterated, they shall be subject to the provisions of this act.

Sec. 3. The term "concentrated commercial feeding stuff" as herein used shall include linseed meals, cocoanut meals, gluten feeds, maize feeds, starch feeds, sugar feeds, dried brewers' grains, malt sprouts, dried distillers' grains, dried beet refuse, hominy feeds, cerealine feeds, rice meals, peanut meals, oat feeds, corn bran, ground beef or fish scraps, mixed feeds, clover meal, and all materials of a similar nature not included in section two of this act.

SEC. 4. Each and every manufacturer, importer, jobber, agent or seller, before selling, offering or exposing for sale in this State any concentrated commercial feeding stuff, as defined in section three of this act, shall for each and every feeding stuff bearing a distinguishing name or trade-mark, file with the Commissioner of Agriculture a copy of the statement named in section one of this act, and accompany said statement, when so requested by the Commissioner of Agriculture, by a sealed glass jar or bottle containing at least one pound of the feeding stuff to be sold, exposed or offered for sale, which sample shall correspond, within reasonable limits, to the feeding stuff which it represents, in the percentages of protein, fat and fiber which it contains.

SEC. 5. Each and every manufacturer, importer, jobber, agent or seller of any concentrated commercial feeding stuff as defined in section three of this act, shall pay to the Commissioner of Agriculture an inspection tax of twenty cents per ton for each ton of such concentrated feeding stuff sold, offered or exposed for sale in the State, and shall affix to each car shipped in bulk, and to each bag, barrel or other package of such concentrated feeding stuff a tag, to be furnished by the said Commissioner of Agriculture, stating that all charges specified in this section have been paid. The Commissioner of Agriculture is hereby empowered to prescribe the form for such tags, and the Board of Agriculture is empowered to adopt standards for concentrated feeding stuffs and such regulations as may be necessary for the enforcement of this law, the violation of any of which regulations shall be a misdemeanor. Whenever a manufacturer, importer or jobber of a concentrated feeding stuff shall have filed the statement named in section one of this act, and paid the inspection tax, no agent or seller of said manufacturer, importer or jobber shall be required to file such statement or pay such tax.

SEC. 6. Any manufacturer, importer, jobber, agent or seller who shall sell, offer or expose for sale or distribution in this State any concentrated commercial feeding stuff as defined in section three of this act, without complying with the requirements of the preceding sections of this act, or who shall sell, or offer or expose for sale or distribution any concentrated commercial feeding stuff which contains substantially a smaller percentage of constituents than are certified to be contained, or who shall adulterate any feeding stuff with foreign mineral or other substance or substances, with substances injurious to the health of domestic animals, shall be guilty of a misdemeanor, and shall be fined not exceeding $50 for each offense, and the lot of feeding stuff in question shall, in addition, be subject to seizure, condemnation and sale by the Commissioner of Agriculture, as prescribed for the seizure, condemnation and sale of commercial fertilizers in this State. Fines and the proceeds from sales under seizure shall be covered into the State treasury for the use of the Department of Agriculture in executing the provisions of this act.

SEC. 7. The Commissioner of Agriculture is hereby authorized to have collected a sample not exceeding two pounds in weight, for analysis, from any lot, parcel or package of concentrated commercial feeding stuff as defined by section three of this act, or unmixed meals, ground grains, wheat bran, wheat middlings or corn by-products, named in section two of this act, which may be in the possession of any manufacturer, importer, agent or dealer, but said sample shall be taken from not less than ten per cent of the whole lot inspected. One or more samples of each feeding stuff collected as herein provided shall be analyzed annually by the State Chemist and his assistants, and the results published in the Bulletin, together with such additional information in relation to the character, composition and use thereof as may seem to be of importance.

SEC. 8. Any manufacturer, dealer or other person who shall impede, obstruct, hinder or otherwise prevent or attempt to prevent any inspector or other person in the performance of his duty in collecting samples, or otherwise in connection with this act, shall be guilty of a misdemeanor, and shall, upon conviction, be fined not less than ten dollars nor more than fifty dollars.

SEC. 9. The Commissioner of Agriculture, upon ascertaining any violation of this act for the first time, shall forthwith notify the manufacturers, importers or sellers in writing, giving them not less than thirty days therefrom in which to comply with the requirements of this act. In case of the second

or subsequent violations by the same party or parties, or in case, after a lapse of thirty days, the requirements of this act remain still uncomplied with, it shall be the duty of the Commissioner of Agriculture to enforce the provisions of this act: *Provided, however*, that there shall be no prosecution in relation to the quality of any concentrated commercial feeding stuff, if the same shall be found to be substantially equivalent to the statement of analysis made by the manufacturers, importers or dealers.

SEC. 10. Magistrates and justices of the peace throughout this State shall have jurisdiction to hear and determine actions arising from violation of the provisions of this act, and to hold for court or impose the penalties prescribed therein, subject to appeal as the law may direct.

SEC. 11. This act shall be in force from and after July 1, 1903.

In the General Assembly read three times and ratified this 2d day of March, A. D. 1903.

AN ACT TO REGULATE THE SALE, INSPECTION AND BRANDING OF COTTON-SEED MEAL.

The General Assembly of North Carolina do enact:

SECTION 1. That all cotton-seed meal sold for use as fertilizer or feed shall be subject to an inspection tax of twenty cents per ton, and be subject to inspection, as other fertilizers or fertilizing materials, unless sold to manufacturers for use in manufacturing fertilizers.

SEC. 2. That all cotton-seed meal offered for sale, unless sold to manufacturers for use in manufacturing fertilizers, shall have plainly branded on the bag containing it, or on the tag attached thereto, the following data:

1—Cotton-seed meal.

2—Weight of package.

3—Ammonia or nitrogen.

4—Name and address of manufacturer.

SEC. 3. That no person or persons, firm nor corporation shall offer for sale any cotton-seed meal, except as provided in section two of this act, with a minimum per cent of ammonia of less than 7½ per cent.

SEC. 4. That the State Board of Agriculture is empowered and directed to make such rules and regulations as are necessary to a proper carrying into effect the provisions of this act, and to provide for all such tags as manufacturers may demand, upon paying the tax therefor. Any person willfully violating any of the regulations made by the Board of Agriculture in connection with this act shall be guilty of a misdemeanor.

SEC. 5. That any person or persons, firm or corporation violating any of the provisions of this act shall be guilty of a misdemeanor, and upon conviction shall be fined or imprisoned, or both, at the discretion of the court.

SEC. 6. That this act shall be in force from and after July 1, 1903.

In the General Assembly read three times, and ratified this 3d day of March, A. D. 1903.

These laws were passed because of the large amount of adulteration of the materials covered by them in the past, as ascertained by the analyses of this Department, and at the suggestion generally of farmers, and particularly of the millers and cotton-seed meal manufacturers of the State, committees from the Millers' Association and Cotton-seed Oil Mill Association appearing before committees of the Legislature for this purpose.

DEFINITIONS AND DESCRIPTIONS OF PRODUCTS.

The name commercial feeding stuff, or concentrated commercial feeding stuff, is usually applied to a class of substances which, in a majority of cases, are the by-products of other branches of industry. Some of these articles, as brans, middlings and cotton-seed meal, have been the daily diet of domestic animals for many years. These products are mainly as follows:

FROM WHEAT.

Bran.—This consists of the outer portion of the wheat grain, and though somewhat rich in indigestible fiber, is a valuable feed because of its protein and fat content. It is also rich in phosphates and potash salts.

Shorts and Middlings.—In the feeding-stuff trade these two products are frequently the same and are the more inner coatings of the wheat grain and are made up of smaller fragments, together with portions of the more starchy part of the wheat grain.

Wheat Germ consists of the embryo of the wheat grain. It is rich in oil and protein.

FROM CORN.

Maize or Corn Bran is the outer husk or coating of the corn grain. It is high in fiber and of low feeding value.

Gluten Meal is the more nitrogenous portion of the corn grain which lies just below the husk. It is what is left after the bran, germ and starch are taken from the grain in the manufacture of starch.

Germ Meal or Cake is the nitrogenous and fatty residue left after extracting the oil from the germ of corn. It is very digestible and an excellent feed.

Corn Cobs consist largely of woody fiber and consequently have low feeding value. When corn has not fully ripened more nutriment remains in the cob, as it is not then so hard and woody. Cobs, when ground with the grain belonging to it, are not objectionable, but rather improve the feed for cattle and horses.

Corn and Cob Meal.—Frequently corn, together with the cob which bears it, are crushed together at the same operation, the resultant product being called corn and cob meal. It is a good feed when well ground.

FROM RICE.

Rice Meal or Bran is the outer layers of the rice grain, together with portions of the germ. They are rich in nitrogenous matter (protein) and fat, and are high in percentage of ash, or mineral matter.

Rice Polish is a fine powder and is a still more highly nitrogenous feed than the meal or bran, as a rule.

FROM OATS.

Oats are almost entirely employed whole or crushed as a feed stuff. The by-products from the manufacture of oat meal are comparatively worthless; the husk or hull, which is the main part of this by-product, being mainly woody fiber and therefore of but little feeding value.

FROM BARLEY.

Malt Sprouts.—Malt is produced by soaking barley in water and allowing it to germinate until the shoots attain a certain length. The malt is then kiln-dried and the shoots broken off. These dried shoots are called malt sprouts and are rich in protein and mineral matter. They are good feed for pigs and cattle.

Dried Brewers' Grains consist of the residue left after "mashing" the malt, whereby the greater portion of the carbohydrates are converted into sugar

and removed. They are largely employed locally as feed for dairy cows. The grains direct from the breweries contain too much water and are too liable to change to permit of their being used except in the immediate vicinity of breweries. When dried they are a valuable feed and are sold under the name of dried brewers' grains.

FROM PEANUTS.

Peanut Cake or Meal is the residue from the extraction of oil from the peanut kernel. It is a very valuable concentrated feed, being rich in both protein and fat. This product, as well as other concentrated feeds, is not infrequently adulterated by grinding with it peanut shells.

FROM COTTON SEED.

Cotton-seed Meal is the ground residue from the extraction of cotton-seed oil from the cotton-seed kernels. Cotton-seed meal of standard grade in this State must contain 7½ per cent of ammonia, which is equal to 38.62 per cent protein. Higher grade meals contain forty and more per cent. When of good quality there is no better feed on our markets for beef cattle and milk cows. Cotton-seed meal is sometimes adulterated with cotton-seed hulls. Occasionally cotton-seed meal from Sea Island cotton seed comes on our market. It is never as valuable as the meal from our upland cotton seed, because it is impossible to separate the hulls from it. It usually has one-half to two-thirds the feeding value of good upland meal.

COMPOSITION OF FEEDING STUFFS.

By chemical analysis foods are separated into six classes of substances, viz.:

1. *Water*, which is present in all feeding stuffs. It composes about 80 per cent of green and succulent fodders, about 90 per cent of root crops, 75 per cent of silage and 10 to 15 per cent of hays and grains. In these it is present as mechanically adhering or hygroscopic moisture. It is a necessary constituent of the animal body, of which it makes up 40 to 65 per cent. Water is determined by heating the substance for several hours at the temperature of boiling water, at which temperature it passes off as steam.

2. *Ash* is the inorganic or mineral matter of plants, and is the residue left after burning till all volatile material is driven off. It is composed mainly of soda, potash, lime and magnesia, in the form of phosphates, sulphates, chlorides and carbonates. Ash furnishes the materials for the bony structure of animals, and enters to a much less extent into the tissues and organs.

3. *Fats (Ether Extract)* represents whatever is dissolved from foods by dry ether. It is composed mainly of fats and oils, but contains, in addition, quantities of gums, wax and coloring matter, depending upon the substances extracted.

4. *Protein*, the term as used in connection with fodder analyses, includes *Albuminoids* and *Amides*, the albuminoids being the more valuable and at the same time composing by far the larger portion of the protein compounds. They are the nitrogenous compounds of plants and animals and are determined by estimating the nitrogen in them, which element composes about 16 per cent of the weight of protein substances. None of the other classes of substances contain nitrogen. They are represented in the animal body by ligaments, lean meat, muscles, tendons and tissues.

5. *Crude Fiber*, or *Cellulose*, is the cell wall and structure material of plants and is usually the most indigestible portion of them, but when digested is considered of equal value to starch and sugar. The lint of cotton is almost pure cellulose. Its composition is similar to that of starch. It is determined by boiling the food stuff with weak acid and alkali, thus dissolving all other constituents. *Crude fiber* and *nitrogen-free extract* taken together are known as *carbohydrates.*

6. *Nitrogen-free Extract* is the term applied to those non-nitrogenous constituents of foods which are represented in the main by sugars, starch, dextrin and gums. They all contain carbon, hydrogen and oxygen, but no nitrogen, as does protein. Nitrogen-free extract is estimated by difference, it being equal to the difference between the sum of the above five constituents—water, ash, protein, fats and crude fiber—and 100. It is, perhaps, the most inaccurate of all the determinations in a food analysis, inasmuch as all the errors and differences in the other determinations fall upon it.

Dry Matter and Organic Matter.—Neither of these terms represents a single class of constituents or nutrients. Dry matter is what is left of a plant or food stuff after the water is driven off or subtracted, and organic matter is dry matter minus the ash. For example: if the original food stuff as fed is represented as 100 per cent and it contains 10 per cent of water and 5 per cent of ash, then dry matter is equal to 100 per cent less 10 per cent water, or 90 per cent, and organic matter is 90 per cent dry matter, less 5 per cent ash, or 85 per cent.

To enable those not familiar with the subject to gain a clear idea of the parts of food stuffs, and the terms representing them as used in fodder analyses, the following statement is presented:

Food-stuff.	Water. / Dry Matter.	Ash. / Organic Matter.	Protein. / Fats. / Carbohydrates.	Nitrogen-free Extract. / Crude Fiber.

Nutrients.—Protein, fats, carbohydrates, nitrogen-free extract and crude fiber and mineral matter are called nutrients because of their functions in animal nutrition. Nitrogen-free extract and crude fiber are included together under the one name of carbohydrates, because they are all compounds of carbon, hydrogen and oxygen, and the digestible portion of each is considered of equal value and performs the same offices in animal nutrition. Familiar examples of the four classes of nutrients are presented below. Water is omitted because it is the same, whether taken in food or drink, and we do not feed a fodder for the sake of the water it contains.

Protein.	Albumen (white of egg), washed lean meat, casein, or curd of milk, gluten of flour, fibrin of blood, gelatin, glue, etc.
Fats.	Cotton-seed oil, linseed oil, olive oil, corn oil, wheat oil, oat oil; the fat of milk (butter), the fat of meat, hog (lard), mutton (mutton suet), beef (tallow), fish oil, etc.
Carbohydrates.	Sugars (cane sugar, milk sugar, and glucose, starch, dextrin, gums, woody fiber, etc.
Mineral Matter.	Sodium chloride (common salt), phosphates of lime and soda, etc.

FUNCTIONS OF NUTRIENTS.

Having discussed the classes of nutrients as they occur in foods, the question may be asked: What offices do these nutrients perform in the animal economy?

Water is not a nutrient in the sense in which the term is here used, though the animal body cannot be supported without it.

The ash, or mineral matter, furnishes the material for the bony structure of the body, and, to a far less extent, of the soft tissues. Most of our foods and rations contain an abundant supply of the mineral elements, so little or no notice need be taken of them in feeding.

Protein differs from all the other nutrients in containing the element nitrogen, and is the producer of flesh, ligaments, muscles, tendons, sinews, hair, hide and all portions of the animal machine which have strength, except the bones. The protein bodies are of the utmost importance in the animal structure. They compose the larger part of the animal machinery, and are the exclusive source of its repair as occasioned by the continuous wear and tear of the system, due to the internal and external movements of the body; they are the basis of blood, and the source of casein in milk; and in the absence of sufficient quantities of fats and carbohydrates in the food for the production of heat and energy, they are transformed into fats, and perform the office of fats in nutrition. This latter transformation may also result from an excess of protein. The heat-producing power of protein is but little different from that of carbohydrates; the amount of fat it produces is probably much less, while, as a heat-producer, fat is worth about 2.25 times as much as protein. These facts, combined with the high cost of protein in foods, renders it usually uneconomical to feed protein for the production of fat to be either stored in the body as such, or to be used as fuel, since the fats and carbohydrates perform these offices, and cost much less. It is to be remembered that the protein bodies are the "flesh formers," and though they can perform the offices of fats and carbohydrates in nutrition, fats and carbohydrates cannot take the place of protein.

Fats and carbohydrates perform the same offices in the body—those of the production of heat to keep the body warm, and the force by which the animal mechanism is run. They are the "heat and force producers," and are consumed in the body as fuel, giving out heat and muscular and intellectual energy. For the production of heat and energy one pound of fat is worth about 2.25 times as much as a pound of carbohydrates. Fats give out about 2.25 times the heat that carbohydrates do. Besides serving as heat and force producers, carbohydrates are converted in the animal body into fats, and, together with the fats of the food, are stored as such in fatty tissue. The value of carbohydrates for the production of fats is supposed to be in about the same proportion as the heat-producing powers of carbohydrates to fats.

Carbohydrates are not found in the animal body as such, but are converted into fats. There are, therefore, only four classes of substances composing the animal body, viz.: water, ash, fats and protein.

The main and distinctive offices of the nutrients of foods are: Ash, or mineral constituents, are bone-producers; the protein bodies are the flesh formers; and fats and carbohydrates are the heat and force producers. The nutrients

already located in the animal body perform the same offices as the corresponding ones of foods. In case of a deficiency of nutrients in foods given, the fats, or protein and fats, are drawn upon to assist in running the animal machine. Carbohydrates and fats, in being consumed, prevent the consumption of protein, but so soon as they become insufficient to supply the necessary heat and force for the body, protein substances, in the form of lean meat, muscle, etc., are drawn upon. A sufficient supply of carbohydrates and fats is, therefore, necessary to the protection of the animal frame-work. The following is a statement of the

FUNCTIONS OF FOOD IN THE ANIMAL BODY.

Food nourishes and supports the body

By supplying—

1. The materials of which it is made.
2. The materials to repair its waste and wear.

By producing—

3. Heat to keep it warm.
4. Force and energy for muscular and other work.

These offices are performed by the nutrients:

Protein.....	Which is the basis of blood, lean meat, tendons, ligaments, sinews, hair, skin, etc. Is converted into fats. Is used as fuel for heat and force.
Fats.....	Are used as fuel for heat and force. Are stored in the fatty tissue of the body.
Carbohydrates (N.-free Ext. and Crude Fiber)	Are converted into fats and stored in the body, or Are used as fuel for heat and force.
Mineral Matter	Forms bone and a very small part of muscular and fatty tissues.

CLASSIFICATION OF FEEDING STUFFS.

Feeding stuffs may be classified as follows:

No. 1.	No. 2.	No. 3.	No. 4.
Very high in Protein—above 40 per cent.	Rich in Protein—25 to 40 per cent.	Fairly rich in Protein—12 to 25 per cent.	Poor in Protein—below 12 per cent.
Cotton-seed Meal. Dried Blood. Meat Scraps.	Linseed Meal. Gluten Meal. Soja Beans. Buckwheat Middlings.	Wheat Shorts. Wheat Bran. Wheat Middlings. Cow-peas. Pea Meal. Oat Shorts. Rye Shorts. Gluten Feed.	Rice Polish. Hominy Chops. Wheat. Oats. Rye. Rice. Corn. Hays, stover, etc.

VALUE OF CONCENTRATED FEEDS.

The value of feeding materials depends first on their composition, which has already been discussed, and second on their

Digestibility.—All feed eaten by an animal is not digested and used in nutrition, but only that portion which is dissolved by the alimentary agents and taken into the circulation of the system, the portion which is assimilated. The residue, or undigested portion, forms the solid excrement of the animal. The digestibility of most of our common feeds has been determined by actual feeding trials as indicated above, and may be found in the Bulletins issued by the Department and the Experiment Station. It is not necessary to repeat them here.

With all classes of feeds high percentages of protein and fat indicate high feeding value. This is well illustrated in cotton-seed meal, linseed meal, soja beans and similar feeds. High percentages of fiber, on the other hand, go with materials having comparatively low feeding value. The farmer, in buying concentrated feeds, should have these facts clearly in mind. He usually buys concentrated feeds to supplement the coarse products, like corn stover and the hays, raised on the farm. It is largely protein that he needs, and there is no economy in purchasing feeds low in protein. The analyses presented in this Bulletin show that where the materials have 5 to 10 or even 12 per cent of protein there are, as a rule, also large quantities of fiber, which means that the by-product is the coarse, chaffy part of the grains, or else these materials have been ground with the other products. Of two feeds having an equal amount of protein, the one which has the smallest amount of fiber is the more valuable, and the farmer will not go far astray if he values the concentrated feed which he purchases in proportion to its content of protein and fat. Except at extremely low figures it is doubtful if it will pay any one to purchase concentrated feeds containing less than 8 to 10 per cent of protein, and when they go below these figures they should be looked upon with suspicion.

The Department desires to make the inspection service relating to concentrated feeds as effective and valuable to the farmers of the State as possible, and to this end it desires the co-operation of farmers, feeders, dealers and manufacturers. It will make analyses of samples for them when taken according to instructions which will be furnished by the Department.

ANALYSES OF SAMPLES OF CONCENTRATED FEEDING STUFFS, SEASON 1903.

On the following pages will be found the results of the chemical and microscopic examinations of the samples of concentrated stock feeds collected by the Inspectors of the Department, and those sent in by farmers, dealers and manufacturers. These analyses, with the discussion of the results which follows them, are deserving of careful consideration on the part of all local dealers and also feeders.

RESULTS OF EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2423	Wheat Bran	Atlanta Milling Co., Atlanta, Ga.	McComb Bros., Hickory, N. C.
2463	Bran	Ballard & Ballard, Louisville, Ky.	J. S. Brown, Oxford, N. C.
1944	do	do	C. B. Hill, New Bern, N. C.
2407	Wheat Bran	Cairo Milling Co., Cairo, Ill.	Collins & Biggers, Monroe, N. C.
2402	do	Cumberland Mills, Nashville, Tenn.	Hardison Co., Wadesboro, N. C.
2470	do	Dan Valley Mills, Danville, Va.	Davis Wadkins Co., Henderson, N. C.
2479	do	Dunlop Mills, Richmond, Va.	S. J. Stallings, Littleton, N. C.
2449	do	do	J. H. Walker & Co., Reidsville, N. C.
2430	Bran	Eagle Flouring Mill, Sweetwater, Tenn.	Foushee-Lawrence Co., Statesville, N. C.
2432	Wheat Bran	do	City Roller Mills, Statesville, N. C.
2424	do	Farmers Milling Co., Conover, N. C.	A. F. Smyre, Newton, N. C.
1939	Bran		Finch's Feed Store, Lexington, N. C.
2437	Wheat Bran	Forsyth Roller Mills, Winston, N. C.	J. F. Griffith, Winston, N. C.
1936	Bran	Guilford Roller Mills, Greensboro, N. C.	Guilford Roller Mills, Greensboro, N. C.
2408	Wheat Bran	Henderson Roller Mill, Monroe, N. C.	Collins & Biggers, Monroe, N. C.
1883	Bran	Hickory Milling Co., Hickory, N. C.	Hickory Milling Co., Hickory, N. C.
1975	do	High Point Milling Co., High Point, N. C.	High Point Milling Co., High Point, N. C.
2452	Wheat Bran	S. C. Hurt & Son, Lynchburg, Va.	Sergeant-Clayton Co., Roxboro, N. C.
2488	do	Knoxville City Mills, Knoxville, Tenn.	Lichenstein & Co., Tarboro, N. C.
2467	do	Liberty Mills, Nashville, Tenn.	P. B. Powell, Henderson, N. C.
2472	do	do	Parham Bros. Supply Co., Henderson, N. C.
2487	Bran	do	Lichenstein & Co., Tarboro, N. C.
1938	do	Model Mills, Lexington, N. C.	Model Mills Lexington, N. C.
2412	Wheat Bran	Mt. City Milling Co., Chattanooga, Tenn.	W. I. Henderson Co., Charlotte, N. C.
1941	Bran	do	Kluttz & Randleman, Salisbury, N. C.
1934	do	do	J. C. Eason & Son, Goldsboro, N. C.
1913	do	do	G. W. Patterson, Concord, N. C.
2500	do	do	
2483	Wheat Bran	do	R. B. Peters Grocery Co., Tarboro, N. C.
1933	Bran	do	Burrus & Gray, New Bern, N. C.
2465	Wheat Bran	Oxford Roller Mills, Oxford, N. C.	Oxford Roller Mills, Oxford, N. C.
2442	do	Southside Mills, Winston, N. C.	Southside Mills, Winston, N. C.
2431	Bran	Statesville Flour Mills, Statesville, N. C.	Foushee-Lawrence Co., Statesville, N. C.
2486	do	F. W. Stock & Sons, Hillsdale, Mich.	W. L. Clark & Son, Tarboro, N. C.
2441	Wheat Bran	Wachovia Mills, Winston, N. C.	Wachovia Mills, Winston, N. C.
1907	Bran	do	

NATION OF BRAN.

Laboratory Number.	Date of Purchase, 1903.	Retail Price of Package.	Claimed Weight of Package—lbs.	Per cent Protein.	Per cent Fat.	Per cent Ash.	Per cent Crude Fiber.	Remarks.
2423	July 29	$1.40	100	17.12	3.75	7.75	6.42	Contains corn bran.
2463	Aug. 10	1.35	100	13.62	3.97	6.47	8.94	All wheat bran.
1944	July 15	1.25	100	16.50	3.87	7.27	9.15	do.
2407	July 24	1.25	100	17.62	4.53	6.35	8.56	do.
2402	July 23	1.25	100	15.87	4.68	5.96	8.51	Contains corn bran.
2470	Aug. 11	1.30	100	13.06	3.84	6.08	8.62	
2479	Aug. 12	1.25	100	13.87	3.86	5.00	8.37	
2449	Aug. 5	1.10	100	15.94	4.52	4.92	7.11	
2430	July 31	1.00	75	15.68	4.60	7.30	8.23	
2432	July 31	1.25	80	15.37	5.02	4.65	4.47	
2424	July 30	1.50	100	15.12	3.93	4.92	5.77	
1939	July 31	------	------	15.38	3.55	4.62	7.99	Contains corn bran, cockle and whole corn.
2437	Aug. 3	1.25	100	14.56	4.48	6.05	7.76	
1936	July 29	1.20	100	16.75	3.77	6.88	9.09	
2408	July 24	1.25	100	12.19	4.56	5.92	10.08	
1883	June 11	------	------	14.69	4.42	6.24	9.15	Contains corn bran.
1975	July 30	1.35	100	17.30	4.44	5.57	8.20	
2452	Aug. 8	1.35	100	14.44	4.46	6.05	9.13	
2488	July 9	1.25	100	16.06	4.71	7.15	9.27	
2467	Aug. 11	1.25	100	14.50	4.19	6.57	7.77	
2472	Aug. 11	1.30	100	14.31	4.45	5.85	8.23	
2487	July 9	1.25	100	15.37	3.29	4.39	6.85	
1938	July 31	1.25	100	17.63	3.97	5.92	7.66	
2412	July 25	1.15	75	13.00	3.91	7.20	12.97	Contains corn bran.
1941	Aug. 1	1.35	100	13.00	3.60	6.22	7.19	do.
1934	July 17	1.25	100	14.25	2.34	13.87	8.36	do.
1913	Aug. 1	1.40	100	16.13	4.20	6.22	9.96	do.
2500	July 29	------	------	16.44	5.05	6.01	7.82	do.
2483	July 9	1.30	100	15.69	3.84	7.17	12.77	Wheat bran.
1933	July 15	------	------	13.15	4.15	6.00	11.89	All wheat bran.
2465	Aug. 11	1.25	100	15.25	4.40	5.45	7.42	
2442	Aug. 3	1.25	100	16.37	4.90	5.10	6.44	
2431	July 31	1.10	80	16.40	5.00	4.92	6.82	
2486	July 9	1.30	100	16.12	6.32	6.15	14.70	
2441	Aug. 3	1.15	100	13.50	3.98	6.17	9.00	
1907	July 27	------	------	14.13	4.06	6.67	11.68	Contains corn bran.

RESULTS OF EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2447	Wheat Bran	J. H. Walker & Co., Reidsville, N. C.	Hutcherson Bros., Reidsville, N. C.
1877	Wheat Bran and Corn Bran.	Statesville Flour Mills, Statesville, N. C.	Statesville Flour Mills, Statesville, N. C.
1995	Corn Bran	High Point Milling Co., High Point, N. C.	

RESULTS OF EXAMINATION

1943	Bran and Shorts	Cabarrus Roller Mill, Concord, N. C.	Cabarrus Roller Mill, Concord, N. C.
1893	Wheat Bran and Shorts.	Grimes Bros., Lexington, N. C.	Grimes Bros., Lexington, N. C.
1884	Bran and Shorts	Hickory Milling Co., Hickory, N. C.	Hickory Milling Co., Hickory, N. C.
2411	----do	Mecklenburg Roller Mills, Charlotte, N. C.	J. Lee Koiner, Charlotte, N. C.
2426	----do	Newton Roller Mills, Newton, N. C.	Newton Roller Mills, Newton, N. C.
1945	----do	Northside Roller Mills, Salisbury, N. C.	Northside Roller Mills, Salisbury, N. C.
2425	----do	North State Roller Mills, Newton, N. C.	North State Roller Mills, Newton, N. C.
2433	----do	Railroad Flour Mills, Statesville, N. C.	Railroad Flour Mills, Statesville, N. C.
2420	----do	Phœnix Roller Mill, Hickory, N. C.	W. L. Long & Co., Hickory, N. C.

RESULTS OF EXAMI

1957	Shorts	Greensboro Roller Mill, Greensboro, N. C.	Greensboro Roller Mill, Greensboro, N. C.
1885	----do	Hickory Milling Co., Hickory, N. C.	Hickory Milling Co., Hickory, N. C.
2418	----do	----do	Bost & Newton, Hickory, N. C.
1987	----do	S. C. Hurt & Son, Lynchburg, Va.	J. M. Morris & Son, Thomasville, N. C.
1966	----do	Lambeth Bros., Thomasville, N. C.	M. Moses, Salisbury, N. C.
2443	----do	Southside Mills, Winston, N. C.	Southside Mills, Winston, N. C.

RESULTS OF EXAMINA

2427	Quaker Dairy Feed	American Cereal Co., Chicago, Ill.	Cooper & Gill, Statesville, N. C.
1993	Cow Feed		D. H. Bright, Kinston, N. C.
2489	----do	J. Havens, Washington, N. C.	
1976	Corn Meal	High Point Milling Co., High Point, N. C.	High Point Milling Co., High Point, N. C.
1994	Mixed Cow Feed	Neuse Milling Co., Kinston, N. C.	Neuse Milling Co., Kinston, N. C.

TION OF BRAN—CONTINUED.

Laboratory Number.	Date of Purchase, 1903.	Retail Price of Package.	Claimed Weight of Package—lbs.	Per cent Protein.	Per cent Fat.	Per cent Ash.	Per cent Crude Fiber.	Remarks.
2447	Aug. 5	$1.35	100	15.62	4.47	5.95	8.12	
1877	June 2	------	------	15.18	7.24	6.02	8.30	Contains large amount of corn bran.
1995	July 30	.50	100	9.12	3.23	2.52	11.50	Corn bran.

OF BRAN AND SHORTS.

1943	Aug. 1	1.25	100	15.75	4.31	5.22	6.04	
1893	July 3	------	------	15.87	4.64	4.79	6.70	
1884	June 11	------	------	16.19	5.00	5.10	6.55	Contains corn bran.
2411	July 25	1.05	80	17.12	4.56	4.79	5.55	
2426	July 30	1.40	100	15.31	3.55	4.52	6.17	
1945	July 31	1.50	100	15.75	3.96	4.00	4.58	
2425	July 30	1.40	100	15.12	3.64	4.60	6.65	
2433	July 31	1.40	100	16.81	2.73	4.22	6.40	
2420	July 29	1.20	80	16.11	4.25	4.55	5.30	

NATION OF SHORTS.

1957	July 29	11.40	100	13.19	1.65	1.58	1.35	
1885	----------	------	------	18.00	5.86	3.59	3.74	
2418	July 29	1.50	100	18.12	3.96	3.02	3.21	
1987	July 30	1.15	80	12.94	3.00	2.32	2.95	
1966	Aug. 1	1.40	100	15.43	3.17	3.37	4.28	
2443	Aug. 3	1.60	100	13.94	3.25	2.01	2.10	

TION OF COW FEEDS.

2427	July 31	1.50	100	14.25	4.23	5.79	--------	Contains large quantity of chaff.
1993	July 16	1.50	100	16.63	3.42	4.54	9.82	Corn meal, rice meal, wheat bran, corn bran, and cotton-seed meal.
2489	----------	------	------	21.81	4.96	3.95	5.76	
1976	July 30	1.60	196	12.25	3.25	1.81	1.74	Corn meal.
1994	July 16	.85	100	17.50	2.21	5.80	10.49	Contains corn bran, whole oats, whole corn, and some wheat bran.

RESULTS OF EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1972	Chops	Dunlop Mills, Richmond, Va.	Phillips & Penny, Raleigh, N. C.
1954	do	Guilford Roller Mills, Greensboro, N. C.	Guilford Roller Mills, Greensboro, N. C.
1973	do	Kentucky Milling Co., Henderson, Ky.	Phillips & Penny, Raleigh, N. C.
1963	do	Northside Roller Mill, Salisbury, N. C.	Northside Roller Mill, Salisbury, N. C.
1988	do	Richmond Flour and Feed Co., Richmond, Va.	Fouts & Grimes, Thomasville, N. C.
2444	do	Southside Mills, Winston, N. C.	Southside Mills, Winston, N. C.

RESULTS OF EXAMINA

2415	Victor Feed	Adams Grain and Provision Co., Charlotte, N. C.	McKee, Son & Co., Lincolnton, N. C.
2410	Royal Feed	The Great Western Cereal Co., Chicago, Ill.	Adams Grain and Provision Co., Charlotte, N. C.
2461	Victor Feed	American Cereal Co., Chicago, Ill.	Parham Produce Co., Oxford, N. C.
2510	Dairy Feed	do	Albemarle Grocery and Feed Co., Edenton, N. C.
1989	Victor Corn and Oat Feed.	do	Burrus & Gray Co., New Bern, N. C.
2460	Feed	Manchester Mills, Manchester, Va.	Parham Bros., Henderson, N. C.
1793	Feed Meal	Richmond Flour and Feed Co., Richmond, Va.	Dewar & Wilder, Raleigh, N. C.
1904	Feed		R. J. Frederick, Guilford College, N. C.
1962	do	Holly Grove Roller Mills, Lexington, N. C.	T. E. Loflin & Son, Lexington, N. C.
1990	do	J. A. Meadows, New Bern, N. C.	J. A. Meadows, New Bern, N. C.
2501	Mixed Feed	Mt. City Milling Co., Chattanooga, Tenn.	Mt. City Milling Co., Chattanooga, Tenn.
2494	Feed	Ballard & Ballard, Louisville, Ky.	W. R. Hurst, Franklinton, N. C.
2492	do	Richmond Flour and Feed Co., Richmond, Va.	W. L. McGhee, Franklinton, N. C.
1964	do	Salisbury Roller Mills, Salisbury, N. C.	Salisbury Roller Mills, Salisbury, N. C.
1896	Mixed Feed	C. L. Spencer, New Bern, N. C.	C. L. Spencer, New Bern, N. C.
1991	do	do	do
2428	Feed	Statesville Flour Mill, Statesville, N. C.	J. C. Turner & Son, Statesville, N. C.
2456	do	Washburn-Crosby Co., Minneapolis, Minn.	T. W. Pass, Roxboro, N. C.
1871	Corn and Oat Feed	Fairbanks & Co. (Jobbers), Richmond, Va.	J. A. Young, Greensboro, N. C.

RESULTS OF EXAMINA

1968	Mill Feed	Atlanta Milling Co., Atlanta, Ga.	G. W. Patterson, Concord, N. C.
1978	do	Archdale Roller Mills, Archdale, N. C.	C. E. Siceloff, High Point, N. C.
2436	do	Cumberland Mills, Nashville, Tenn.	Rose & Wilson, Winston, N. C.
1903	do	N. R. Savage & Son, Richmond, Va.	Davidson-Dunlap Mfg. Co., Causey, N. C.
1969	do	Dry-Heath-Miller Co., Concord, N. C.	Dry-Heath-Miller Co., Concord, N. C.

NATION OF CHOPS.

Laboratory Number.	Date of Purchase, 1903.	Retail Price of Package.	Claimed Weight of Package—lbs.	Per cent Protein.	Per cent Fat.	Per cent Ash.	Per cent Crude Fiber.	Remarks.
1972	Aug. 5	$1.30	100	15.87	4.08	5.05	6.12	
1954	July 29	1.25	100	13.50	3.94	2.34	4.08	Wheat and corn bran.
1973	Aug. 5	1.25	100	12.75	1.49	1.98	18.19	Wheat bran, rice chaff and corn meal.
1963	July 31	1.50	100	15.50	2.36	2.50	3.10	Wheat bran, with some cockle.
1988	July 30	1.00	80	8.56	1.69	6.31	15.18	Contains rice chaff and some corn bran.
2444	Aug. 3	1.70	100	9.50	4.56	1.45	1.26	Contains corn bran.

TION OF MIXED FEED.

2415	July 28	1.50	100	6.19	2.21	7.85	16.93	Large amount of oat chaff—very low grade feed.
2410	July 25	1.00	100	6.50	2.41	8.75	22.50	Large amount of oat chaff—very low grade feed.
2461	Aug. 10	1.40	100	10.00	1.75	3.56	9.55	Large amount chaff, some corn bran—low grade feed.
2510	July 10	------	------	14.50	3.29	5.60	14.45	Contains a large amount of oat chaff.
1989	July 15	1.40	100	8.25	4.00	4.37	11.25	Cracked corn, whole oats and oat hulls.
2460	Aug. 10	1.25	100	15.25	3.19	4.55	6.05	
1793	Sept. 21	1.30	90	8.56	--------	1.75	--------	Corn and cob meal, with mill cleanings—very dirty.
1904	July 27	------	------	9.50	3.75	2.45	7.23	Nearly all corn bran, some wheat bran and ground corncob.
1962	July 31	1.35	96	12.38	2.60	2.70	3.92	Corn meal, cracked corn, corn bran, wheat bran and oat hulls.
1990	July 15	1.40	100	12.25	1.56	1.69	3.44	Cracked corn, corn meal, corn bran, wheat bran and whole oats.
2501	July 29	------	------	14.31	4.17	3.99	4.85	Wheat bran, shorts and corn bran.
2494	Aug. 6	1.50	100	15.81	4.47	4.22	6.44	
2492	Aug. 6	1.35	100	10.50	2.50	4.30	12.09	Contains ground corn product.
1964	July 31	1.40	100	13.68	2.02	2.26	2.20	
1896	July 15	------	------	10.44	7.45	3.62	6.65	Whole oats, corn meal, some corn bran, some finely ground corn.
1991	July 15	1.40	100	13.25	4.21	3.70	7.19	Corn meal, wheat bran and whole oats.
2428	July 31	1.40	100	13.37	5.59	5.73	7.57	
2456	Aug. 8	1.35	100	20.25	5.56	3.80	2.47	
1871	May 20	------	------	5.87	--------	9.64	--------	Mill cleanings and a large quantity of weed seed—very low grade.

TION OF MILL FEED.

1968	Aug. 1	1.40	100	12.50	3.02	6.95	11.61	Contains bran and rice chaff.
1978	July 30	1.00	80	14.37	3.12	3.52	5.27	Wheat bran.
2436	Aug. 3	1.35	100	16.94	2.90	3.80	4.14	All wheat product.
1903	July 27	------	------	13.81	3.64	4.34	--------	do.
1969	Aug. 1	1.30	100	10.38	3.65	1.92	2.75	Ground corn and wheat bran.

RESULTS OF EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1959	Mill Feed	High Point Milling Co., High Point, N. C.	High Point Milling Co., High Point, N. C.
2507	do	Richmond Flour and Feed Co., Richmond, Va.	E. W. Flake, Polkton, N. C.
1882	do	Horton & Turner (Jobbers), Raleigh, N. C.	W. A. Liles, Wakefield, N. C.
2922	do	Richmond Flour and Feed Co., Richmond, Va.	Sampled at S. A. L. Depot, Raleigh, N. C.
2484	do	do	R. B. Peters Grocery Co., Tarboro, N. C.
2506	do	do	Dr. R. A. Shumpoch, Gold Hill, N. C.
2409	do	J. Allen Smith Co., Knoxville, Tenn.	S. B. Hart, Monroe, N. C.
1898	do	J. H. Walker & Co., Reidsville, N. C.	

RESULTS OF EXAMINA

2455	Middlings	J. E. Blackwell	T. W. Pass, Roxboro, N. C.
1947	do	Gambrill Manufacturing Co., Baltimore, Md.	Fonville Grocery Co., Goldsboro, N. C.
2446	do	G. E. Grain Co., Minneapolis, Minn.	Hutcherson Bros., Reidsville, N. C.
2450	do	do	L. M. Neal, Yanceyville, N. C.
1955	do	Guilford Roller Mills, Greensboro, N. C.	Guilford Roller Mills, Greensboro, N. C.
2468	Peanut Middlings	Phœnix Mills, Petersburg, Va.	R. B. Powell, Henderson, N. C.
2458	do	Patapsco Mills, Baltimore, Md.	J. W. & D. S. Fuller, Oxford, N. C.
1878	Middlings	Statesville Flour Mill, Statesville, N. C.	

RESULTS OF EXAMINA

2482	Rice Meal	Carolina Rice Mills, Goldsboro, N. C.	R. B. Peters Grocery Co., Tarboro, N. C.
1948	do	do	J. C. Eason & Son, Goldsboro, N. C.
1872	do		W. H. McNair, Tarboro, N. C.
2485	Rice Product	Savannah Rice Mills Co., Savannah, Ga.	Bowen & Co., Tarboro, N. C.
2502	Rice Bran		Weil Brothers, Goldsboro, N. C.
2503	Rice Meal		do

RESULTS OF EXAMINA

1958	Ship-stuff	Atlanta Milling Co., Atlanta, Ga.	C. E. Siceloff, High Point, N. C.
2493	do	Ballard & Ballard, Louisville, Ky.	B. W. Ballard Co., Franklinton, N. C.
1980	do	do	P. H. Johnson, High Point, N.C.
2474	do	do	J. H. Harrison, Littleton, N. C.
2478	do	Carolina Milling Co., Weldon, N. C.	S. J. Stallings, Littleton, N. C.
1977	do	Dan Valley Mills, Danville, Va.	C. E. Siceloff, High Point, N. C.

OF MILL FEED—CONTINUED.

Laboratory Number.	Date of Purchase, 1903.	Retail Price of Package.	Claimed Weight of Package—lbs.	Per cent Protein.	Per cent Fat.	Per cent Ash.	Per cent Crude Fiber.	Remarks.
1959	July 30	$1.40	100	11.13	3.97	2.17	2.81	Corn bran, wheat bran, cracked corn and oats.
2507	Sept. 9 1902.	------	------	13.19	1.17	7.97	12.14	Contains chaff, ground beans and ground corn.
1882	Jan. 9	------	------	7.81	--------	5.40	--------	Wheat shorts, containing much cockle and chaff—low grade feed.
2922	Oct. 7	------	------	10.12	3.92	5.37	11.31	Finely ground wheat chaff, bran, ground corn, ground corncob.
2484	July 9	1.25	92	8.50	3.22	1.60	3.60	Contains a large amount of corn bran—low grade feed.
2506	Sept. 9	------	------	12.65	1.31	6.92	13.95	Ground corn, oat hulls and ground corncob.
2409	July 24	1.45	100	14.00	5.03	3.60	5.81	All wheat product.
1898	July 13	------	------	12.37	4.11	3.89	7.57	Contains corn bran.

TION OF MIDDLINGS.

2455	Aug. 8	1.35	100	17 50	4.01	3.92	5.43	All wheat product.
1947	July 17	1.25	80	17.62	3.66	2.82	2.55	do.
2446	Aug. 5	1.60	100	19.12	3.33	3.49	4.34	do.
2450	Aug. 6	1.60	100	19.25	5.07	3.86	3.03	do.
1955	July 29	1.30	100	13.81	2.62	2.00	2.37	
2468	Aug. 11	.85	100	8.81	1.39	18.30	39.70	Ground peanut shells—low grade feed.
2458	Aug. 10	1.40	80	13.37	3.97	3.25	2.76	All wheat product.
1878	June 2	------	------	16.25	6.45	5.38	7.36	Contains finely-ground corn bran.

TION OF RICE PRODUCTS.

2482	July 9	1.25	100	9.93	7.20	9.94	15.27	Contains rice chaff.
1948	July 17	.80	90	14.63	4.91	7.35	12.57	do.
1872	May 27	------	------	5.62	--------	15.80	--------	Rice bran, somewhat dirty—low grade feed.
2485	July 9	1.25	100	5.81	3.32	11.40	19.50	Contains a large amount of rice chaff—low grade feed.
2502	Sept. 2	------	------	16.47	10.19	16.36	15.77	Contains rice chaff.
2503	Sept. 2	------	------	10.75	9.21	10.31	13.50	Ground rice and rice chaff.

TION OF SHIP-STUFF.

1958	July 30	------	------	11.25	2.46	8.22	16.35	Some wheat bran, but largely rice chaff.
2493	Aug. 6	1.50	100	15.94	4.27	4.67	5.76	All wheat product.
1980	July 30	1.40	80	12.25	2.91	2.20	2.55	do.
2474	Aug. 12	1.40	100	17.75	4.36	4.87	6.12	do.
2478	Aug. 12	1.35	100	11.44	3.88	8.50	14.41	Contains ground peanut hulls.
1977	July 30	1.00	80	16.50	3.77	4.42	5.47	

RESULTS OF EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2469	Ship-stuff	Dan Valley Mills, Danville, Va.	Davis & Watkins Co., Henderson, N. C.
2435	do	do	H. P. Poindexter, Winston, N. C.
2401	do	Dunlop Mills, Richmond, Va.	The Hardison Co., Wadesboro, N. C.
2404	do	do	F. C. Allen, Wadesboro, N. C.
2476	do	do	S. J. Stallings, Littleton, N. C.
1911	do	Mt. City Milling Co., Chattanooga, Tenn.	Dry-Heath-Miller Co., Concord, N. C.
2473	do	F. G. Fairbanks & Co., Nashville, Tenn.	Parham Bros. Supply Co., Henderson, N. C.
1967	do	Fenix Flouring Mill, Concord, N. C.	Fenix Flouring Mill, Concord, N. C.
2439	do	Forsyth Roller Mills, Winston, N. C.	Forsyth Roller Mills, Winston, N. C.
1952	do	S. C. Hurt & Son, Lynchburg, Va.	Tucker & Erwin, Greensboro, N. C.
2451	do	do	Sergeant-Clayton Co., Roxboro, N. C.
2454	do	do	Hugh Wood, Roxboro, N. C.
1974	do	High Point Milling Co., High Point, N. C.	High Point Milling Co., High Point, N. C.
2466	do	Liberty Mills, Nashville, Tenn.	R. B. Powell, Henderson, N. C.
1899	do	J. H. Walker & Co., Reidsville, N. C.	W. C. Iseley, Burlington, N. C.
2275	do		T. Ivey, Cary, N. C.
1960	do	Lexington Roller Mill, Lexington, N. C.	Lexington Roller Mill, Lexington, N. C.
1983	do	Lexington Grocery Co. (Jobbers), Lexington, N. C.	D. C. Moffit, Thomasville, N. C.
1897	do	Mt. City Milling Co., Chattanooga, Tenn.	
2499	do	do	
1984	do	do	Depot, Thomasville, N. C.
1914	do	do	Kluttz & Randleman, Salisbury, N. C.
2421	do	do	W. S. Long & Co., Hickory, N. C.
2459	do	do	J. T. Sizemore, Oxford, N. C.
2462	do	do	Parham Brothers Co., Oxford, N. C.
2480	do	do	Rocky Mount Supply Co., Rocky Mount, N. C.
1910	do	do	Neuse Milling Co., Kinston, N. C.
1912	do	do	G. W. Patterson, Concord, N.C.
1764	do		Ricks, Alford, Batchelor, Nashville, N. C.
2406	do	J. Allen Smith Co., Knoxville, Tenn.	Collins & Biggers, Monroe, N. C.
2457	do	South Boston Grocery Co., South Boston, Va.	T. W. Pass, Roxboro, N. C.
1953	do	J. C. Tate (Broker), Greensboro, N. C.	Coe Brothers, Greensboro, N. C.
2438	do	Tennessee Milling Co., Nashville, Tenn.	J. F. Griffith, Winston, N. C.
2475	do	do	Eugene Johnson, Littleton, N. C.
1986	do	Thomasville Roller Mills, Thomasville, N. C.	Thomasville Roller Mills, Thomasville, N. C.

OF SHIP-STUFF—CONTINUED.

Laboratory Number.	Date of Purchase, 1903.	Retail Price of Package.	Claimed Weight of Package—lbs.	Per cent Protein.	Per cent Fat.	Per cent Ash.	Per cent Crude Fiber.	Remarks.
2469	Aug. 11	$1.35	100	14.19	4.14	4.57	5.59	
2435	Aug. 3	1.40	100	16.56	3.57	4.70	6.43	
2401	July 23	1.40	100	14.24	3.58	3.92	4.71	
2404	July 23	1.40	100	16.44	4.31	4.45	5.80	All wheat product.
2476	Aug. 12	1.40	100	16.31	3.73	4.97	5.96	do.
1911	Aug. 1	1.40	100	14.25	4.45	5.95	9.41	do.
2473	Aug. 11	1.35	100	16.63	9.47	4.81	5.73	do.
1967	Aug. 1	1.25	100	18.06	5.24	3.70	3.10	do.
2439	Aug. 3	------	------	13.52	4.57	3.29	3.23	do.
1952	July 29	1.45	100	11.93	3.93	3.25	6.59	
2451	Aug. 8	1.35	100	11.50	2.87	1.92	2.38	Corn meal and wheat bran.
2454	Aug. 8	1.40	100	12.77	3.17	2.55	3.06	Contains corn meal.
1974	July 30	1.35	100	15.75	2.88	4.29	6.60	Wheat and corn bran.
2466	Aug. 30	1.35	100	--------	4.83	4.06	4.03	All wheat product.
1899	July 15	------	------	7.94	2.81	3.43	15.91	Contains some corn bran.
2275	Aug. 17	------	------	12.00	--------	6.51	--------	
1960	July 31	1.25	100	17.25	4.95	4.77	7.58	Wheat bran, corn bran and corn meal.
1983	July 30	1.35	100	13.88	1.57	4.09	7.28	Cracked corn and a small amount of foreign husks.
1897	July 13	------	------	12.56	3.92	5.89	7.59	Contains some corn product.
2499	Aug. 29	------	------	14.75	3.95	3.35	4.07	
1984	July 30	------	------	13.50	2.12	5.52	7.97	Contains corn bran.
1914	Aug. 1	1.35	100	15.50	3.58	6.15	9.46	do.
2421	July 29	------	------	14.75	3.68	5.65	9.05	Contains corn bran and rice chaff.
2459	Aug. 10	1.35	100	12.46	3.06	6.04	9.10	Wheat bran and corn bran.
2462	Aug. 10	1.35	100	12.81	3.08	7.62	8.57	Contains corn bran.
2480	July 8	1.25	100	15.50	2.01	5.62	9.34	
1910	July 16	1.35	100	11.88	2.68	12.81	15.95	Contains corn bran.
1912	Aug. 1	1.40	100	13.25	3.10	6.84	10.89	do.
1764	----------	------	------	11.57	--------	6.33	--------	Contains weed seeds, dirt, large amount of chaff and cockle.
2406	July 24	1.30	100	16.12	5.10	3.49	5.24	Contains some corn bran.
2457	Aug. 8	1.15	100	11.06	2.55	6.47	14.55	Peanut hulls, ground rice chaff and ground rice.
1953	July 29	1.35	100	15.50	3.34	4.73	6.46	
2438	Aug. 3	1.25	100	15.68	4.38	3.72	3.91	Wheat product.
2475	Aug. 12	1.30	100	--------	3.85	4.07	4.76	do.
1986	July 30	1.25	100	13.31	2.97	2.99	3.58	All wheat product.

RESULTS OF EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1903	Ship-stuff	N. R. Savage & Son, Richmond, Va.	Davidson-Dunlap Manufacturing Co., Causey, N. C.
1940	do	Salisbury Roller Mills, Salisbury, N. C.	Salisbury Roller Mills, Salisbury, N. C.
2448	do	J. H. Walker & Co., Reidsville, N. C.	J. H. Walker & Co., Reidsville, N. C.
1951	do	J. H. Walker & Co., Reidsville, N. C.	Heath & Snow, Greensboro, N. C.
2471	do	Richmond Flour and Feed Co., Richmond, Va.	Parham Bros. Supply Co., Henderson, N. C.
2405	do	do	Collins & Biggers, Monroe, N. C.
1970	do	do	Glen & Carroll, Concord, N. C.
1982	do		High Point Provision Co., High Point, N. C.
1971	do		Cannon and Fetzer Co., Concord, N. C.
2440	do	Wachovia Mills, Winston, N. C.	Wachovia Mills, Winston, N. C.
1906	do	do	do
2445	do	Williams-Crewes Co., Danville, Va.	Hutcherson Bros., Reidsville, N. C.

MISCEL

1996	Chicken Feed	Richard & Biggs, Baltimore, Md.	J. W. Iseler & Co., Goldsboro, N. C.
1832	Blomo Horse Feed	Blomo Manufacturing Co., New York City.	
1740	Mill Feed	J. B. Boddie, Nashville, N. C.	
1956	Hog Feed	Greensboro Roller Mills, Greensboro, N. C.	Greensboro Roller Mills, Greensboro, N. C.
1901	Soja Beans and Corn	J. Havens, Washington, N. C.	
1900	Hog Feed	do	
1753	Distillery Slop		John Kimberly, Asheville, N. C.
2504		Statesville Flour Mills, Statesville, N. C.	Statesville Flour Mills, Statesville, N. C.
2481	Red Dog	E. S. Woodworth & Co., Minneapolis, Minn.	Hales & Edwards, Rocky Mount, N. C.
2453	Feed		A. R. Foushee, Roxboro, N. C.

OF SHIP-STUFF—CONTINUED.

Laboratory Number.	Date of Purchase, 1903.	Retail Price of Package.	Claimed Weight of Package—lbs.	Per cent Protein.	Per cent Fat.	Per cent Ash.	Per cent Crude Fiber.	Remarks.
1903	July 27	$-----	------	9.04	3.48	1.86	2.05	Corn meal, wheat bran, some corn bran.
1940	July 31	1.30	100	16.81	4.90	5.10	6.42	All wheat product.
2448	Aug. 5	1.50	100	16.69	5.50	3.06	2.90	do.
1951	July 29	1.45	100	13.31	14.17	3.27	6.50	do.
2471	Aug. 11	1.30	100	7.69	3.07	5.52	14.96	Contains ground rice chaff, corn product—low grade feed.
2405	July 24	1.30	100	6.50	1.75	6.41	13.74	Contains ground rice and rice chaff—low grade feed.
1970	Aug. 1	.75	100	12.25	1.45	13.77	28.84	Excessive amount of rice chaff.
1982	July 30	1.30	100	11.87	3.22	4.27	15.16	All wheat product.
1971	Aug. 1	1.40	100	18.12	5.20	4.27	4.35	do.
2440	Aug. 3	1.40	98	13.37	2.84	2.08	1.78	
1906	Aug. 3	------	------	11.44	3.48	1.86	2.05	Contains corn meal, wheat bran and some corn bran.
2445	July 5	1.60	100	16.00	2.43	1.55	1.88	All wheat product.

LANEOUS.

1996	July 17	1.20	80	16.50	2.77	4.92	5.30	Contains corn, oats and wheat.
1832	----------	------	------	15.81	--------	11.84	--------	Contains oat hulls and weed seeds.
1740	Jan. 28	------	------	12.25	--------	12.07	--------	Corn bran and cockle.
1956	July 29	1.30	100	13.50	3.25	3.12	3.80	Wheat bran, corn bran and cockle.
1901	----------	1.35	100	14.00	7.16	2.29	2.59	Cracked beans and cracked corn.
1900	----------	1.00	100	23.18	11.73	5.46	5.72	Whole oats, cracked beans and cracked corn.
1753	----------	------	------	1.37	.67	.31	--------	
2504	----------	------	------	14.75	5.61	4.25	6.84	Contains corn bran.
2481	July 11	1.40	100	18.37	4.20	3.35	3.03	Wheat product.
2453	Aug. 8	1.40	100	18.50	4.80	3.27	2.88	All wheat product.

RESULTS OF EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1759	Cotton-seed Meal	Ayden Milling and Manufacturing Co., Ayden, N. C.	New Bern Cotton and Fertilizer Mills, New Bern, N. C.
1806	do	do	J. G. Barber & Sons, Clayton, N. C.
1805	do	do	do
1766	do	Battleboro Oil Co., Battleboro, N. C.	
1767	do	do	
1800	do	do	
2491	do	Conetoe Oil Mill, Conetoe, N. C.	
1831	do	Southern Oil Co., Conetoe, N. C.	W. R. Felton, Conetoe, N. C.
1824	do	Conetoe Oil Mill, Conetoe, N. C.	Dr. R. J. Grimes, Bethel, N. C.
1867	do	Consumers Cotton Oil Co., Tarboro, N. C.	
1810	do	Cotton Oil and Fiber Co., Norfolk, Va.	
1778	do	do	
1772	do	Dunn Oil Co., Dunn, N. C.	
1758	do	do	
1803	do	Farmers Oil Mill Co., Wilson, N. C.	
1738	do	do	
1739	do	do	
1715	do	do	
1890	do	Florida Cotton Oil Co., Jacksonville, Fla.	
1908	do	do	Burrus & Gray, New Bern, N. C.
1909	do	do	C. L. Spencer, New Bern, N. C.
1787	do	Fremont Oil Co., Fremont, N. C.	
1792	do	do	
1736	do	Haven's Oil Co., Washington, N. C.	
2921	do	do	
1862	do	Highland Park Manufacturing Co., Rock Hill, S. C.	
2403	do	Independent Cotton Oil Co., Wadesboro, N. C.	
1844	do	do	
2287	do	Kershaw Oil Mill, Kershaw, S. C.	Max Moses, Salisbury, N. C.
1777	do	Laurinburg Oil Co., Laurinburg, N. C.	
1876	do	N. C. Cotton Oil Co., Charlotte, N. C.	
1773	do	Lenoir Oil and Ice Co., Kinston, N. C.	
2490	do	do	
2925	do	do	

OF COTTON-SEED MEAL.

Laboratory Number.	Date of Purchase, 1903.	Per cent Ammonia.	Per cent Protein.*	Per cent Fat.	Per cent Ash.	Per cent Crude Fiber.	Remarks.
1759	----------	8.12	41.81	-------	-------	-------	
1806	Feb. 21	7.96	41.00	-------	-------	-------	
1805	Feb. 21	8.34	42.94	-------	-------	-------	
1766	----------	8.19	42.19	-------	-------	-------	
1767	----------	8.53	43.94	-------	-------	-------	
1800	Feb. 23	7.79	40.13	-------	-------	-------	
2491	July 10	7.17	36.94	6.91	6.15	11.38	Below standard.
1831	April 18	6.98	35.94	-------	-------	-------	do.
1824	April 9	7.08	36.44	-------	-------	-------	do.
1867	----------	8.28	42.62	-------	-------	-------	
1810	April 1	8.14	41.94	-------	-------	-------	
1778	----------	8.58	44.19	-------	-------	-------	
1772	----------	8.01	41.25	-------	-------	-------	
1758	----------	7.92	40.75	-------	-------	-------	
1803	Feb. 21	7.04	36.25	-------	-------	-------	Low grade.
1738	Jan. 26	8.42	43.37	-------	-------	-------	
1739	Jan. 26	7.56	39.94	-------	-------	-------	
1715	Jan. 3	7.95	40.94	-------	-------	-------	
1890	June 26	5.03	25.88	-------	-------	-------	Sea Island meal—very low grade in comparison with good upland meal.
1908	----------	4.65	23.94	5.47	5.08	16.04	do.
1909	----------	4.72	24.31	7.17	5.67	16.26	do.
1787	Mar. 14	8.04	41.38	-------	-------	-------	
1792	Mar. 19	8.31	42.81	-------	-------	-------	
1736	----------	8.40	43.25	-------	-------	-------	
2921	Oct. 3	7.62	38.75	9.77	-------	-------	
1862	May 15	8.76	45.13	-------	-------	-------	
2403	July 23	8.35	43.00	8.70	6.46	5.65	
1844	April 28	8.54	44.00	-------	-------	-------	
2287	Aug. 28	7.89	40.62	7.01	6.14	7.18	
1777	----------	7.87	40.50	8.10	-------	-------	
1876	----------	7.06	36.37	-------	-------	-------	Below standard.
1773	----------	8.26	42.50	-------	-------	-------	
2490	----------	7.70	39.62	7.99	6.46	7.84	
2925	Oct. 15	8.16	42.00	-------	-------	-------	

*The per cent of Ammonia multiplied by 5.15 gives the Protein.

RESULTS OF EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1760	Cotton-seed Meal	Lenoir Oil and Ice Co., Kinston, N. C.	
1761	do	do	
2280	do	do	D. H. Bright, Kinston, N. C.
2928	do	Laurinburg Oil Co., Laurinburg, N. C.	
1770	do	Louisburg Oil Co., Louisburg, N. C.	
1841	do		H. A. Smithwick, Louisburg, N. C.
1791	do	McNally Manufacturing Oil Co., Norfolk, Va.	
1742	do	New Bern Cotton Oil and Fertilizer Mills, New Bern, N. C.	
1790	do	do	
1740	do	N. C. Cotton Oil Co., Wilmington, N. C.	
1743	do	N. C. Cotton Oil Co., Raleigh, N. C.	
1744	do	do	
1746	do	do	
1745	do	do	
1797	do	N. C. Cotton Oil Co., Wilmington, N. C.	
1812	do	do	
1795	do	N. C. Cotton Oil Co., Charlotte, N. C.	
1849	do	N. C. Cotton Oil Co., Wilmington, N. C.	
1776	do	N. C. Cotton Oil Co., Charlotte, N. C.	
1769	do	N. C. Cotton Oil Co., Wilmington, N. C.	
1782	do	N. C. Cotton Oil Co., Henderson, N. C.	
2413	do	N. C. Cotton Oil Co., Charlotte, N. C.	Miller & Campbell, Charlotte, N. C.
2284	do	do	Hiatt & Lamb, Greensboro, N. C.
2288	do	Southern Cotton Oil Co., Concord, N. C.	
2282	do	Southern Cotton Oil Co., Goldsboro, N. C.	Fonville Grocery Co., Goldsboro, N. C.
1731	do	Pine Level Oil Co., Pine Level, N. C.	
1848	do	Rowland Oil and Fertilizer Co., Rowland, N. C.	
1729	do	do	
1892	do	Saint Lewis Oil Mill, Saint Lewis, N. C.	
1891	do	do	
1838	do	Southern Cotton Oil Co., Monroe, N. C.	
2283	do	Southern Cotton Oil Co., Goldsboro, N. C.	Fonville Grocery Co., Goldsboro, N. C.
2279	do	do	Bizzell & Wooten, Goldsboro, N. C.
1845	do	Selma Cotton Oil Co., Selma, N. C.	
1749	do	Southern Cotton Oil Co., Goldsboro, N. C.	W. E. Ham, Pikeville, N. C.

OF COTTON-SEED MEAL—CONTINUED.

Laboratory Number.	Date of Purchase, 1903.	Per cent Ammonia.	Per cent Protein.	Per cent Fat.	Per cent Ash	Per cent Crude Fiber.	Remarks.
1760	----------	8.32	42.81	----------	----------	----------	
1761	----------	7.26	37.37	----------	----------	----------	Below standard.
2280	July 16	7.77	40.31	8.62	6.40	7.49	
2928	----------	8.13	41.87	----------	----------	----------	
1770	----------	8.36	43.06	----------	----------	----------	
1841	April 27	8.08	41.62	----------	----------	----------	
1791	Mar. 19	8.38	43.12	----------	----------	----------	
1742	----------	8.67	44.62	----------	----------	----------	
1790	Mar. 19	8.06	41.50	----------	----------	----------	
1740	----------	7.59	39.06	----------	----------	----------	
1743	----------	8.22	42.31	----------	----------	----------	
1744	----------	8.29	42.69	----------	----------	----------	
1746	----------	8.42	43.37	----------	----------	----------	
1745	----------	8.23	42.37	----------	----------	----------	
1797	----------	7.52	38.75	----------	----------	----------	
1812	----------	8.23	42.37	----------	----------	----------	
1795	----------	7.94	40.87	----------	----------	----------	
1849	----------	7.91	40.75	----------	----------	----------	
1776	----------	8.37	43.12	----------	----------	----------	
1769	----------	7.54	38.81	----------	----------	----------	
1782	----------	8.00	41.19	----------	----------	----------	
2413	July 25	8.36	43.93	10.12	6.15	5.30	
2284	July 29	8.32	42.81	10.47	6.15	5.82	
2288	Aug. 1	8.60	44.25	8.03	6.00	6.07	
2282	July 17	7.38	38.00	7.30	5.72	10.64	Below standard.
1731	----------	7.63	39.31	----------	----------	----------	
1848	----------	7.70	39.62	----------	----------	----------	
1729	----------	8.38	43.12	----------	----------	----------	
1892	July 1	7.35	37.87	----------	----------	----------	Below standard.
1891	July 1	8.13	41.88	----------	----------	----------	
1838	April 23	8.51	43.81	----------	----------	----------	
2283	July 17	7.32	37.69	6.05	5.55	12.09	Below standard.
2279	July 17	7.54	38.81	7.12	5.87	10.97	
1845	April 28	8.03	41.37	----------	----------	----------	
1749	----------	8.03	41.37	----------	----------	----------	

RESULTS OF EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1737	Cotton-seed Meal	Southern Cotton Oil Co., Goldsboro, N. C.	
1762	do	Southern Cotton Oil Co., Tarboro, N. C.	
1735	do	Southern Cotton Oil Co., Goldsboro, N. C.	
1798	do	Southern Cotton Oil Co., Wilson, N. C.	
1799	do	Southern Cotton Oil Co., Goldsboro, N. C.	
1815	do	Southern Cotton Oil Co., Conetoe, N. C.	
1801	do	Southern Cotton Oil Co., Concord, N. C.	
1813	do	Southern Cotton Oil Co., Rocky Mount, N. C.	
1846	do	Southern Cotton Oil Co., Wilson, N. C.	
1840	do	Southern Cotton Oil Co., Gastonia, N. C.	
1839	do	Southern Cotton Oil Co., Charlotte, N. C.	
1863	do	do	
1864	do	Southern Cotton Oil Co., Wilson, N. C.	
1865	do	do	
1866	do	do	
1835	do	Southern Cotton Oil Co., Goldsboro, N. C.	
1836	do	do	
1757	do	do	
1768	do	Southern Cotton Oil Co., Conetoe, N. C.	
1783	do	Southern Cotton Oil Co., Wilson, N. C.	
1752	do		James F. Tarkinton, Mackey's Ferry, N. C.
1751	do		do
1814	do	Tar River Oil Co., Tarboro, N. C.	
1784	do	do	
1806	do	Virginia-Carolina Chemical Co., Richmond, Va.	
1750	do	Verner Oil Mill, Latfimore, N. C.	

OF COTTON-SEED MEAL—CONTINUED.

Laboratory Number.	Date of Purchase, 1903.	Per cent Ammonia.	Per cent Protein.	Per cent Fat.	Per cent Ash.	Per cent Crude Fiber.	Remarks.
1737		8.28	42.62				
1762		7.68	39.62				
1735		8.26	42.50				
1798		7.64	39.31				
1799		7.70	39.62				
1815		8.08	41.62				
1801		8.51	43.81				
1813		8.13	41.88				
1846		8.58	44.19				
1840		8.68	44.68				
1839		8.68	44.68				
1863		8.38	43.12				
1864		7.98	41.06				
1865		7.72	39.75				
1866		8.60	44.25				
1835		7.84	40.37				
1836		7.70	39.62				
1757		8.20	42.25				
1768		8.18	42.12				
1783		7.82	40.25				
1752		8.24	42.43				
1751		8.70	44.81				
1814		8.62	44.37				
1784		8.36	43.06				
1806		7.84	40.37				
1750		8.23	42.37				

RESULTS OF EXAMINATION OF

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1823	Cotton-seed Meal		N. B. Dawson, Conetoe, N. C.
1822	do		do
1847	do		do
1775	do		R. M. Gidney, Shelby, N. C.
1774	do		do
1820	do		C. E. Godwin, Smithfield, N. C.
1826	do		M. Hoffman & Bro., Scotland Neck, N. C.
1804	do		J. S. Josey, Scotland Neck, N. C.
1755	do	Gibson Oil Co., Gibson, N. C.	J. A. McGregor, Conclave, N. C.
1756	do	do	do
1870	do	Louisburg Cotton Oil Co., Louisburg, N. C.	J. P. McDowell, Leggett, N. C.
1843	do		do
1875	do		M. W. McLean, Raeford, N. C.
1850	do		N. S. Peel & Co., Williamston, N. C.
1821	do	J. E. Soper & Co., Boston, Mass.	W. & S. Cars, Edenton, N. C.
1842	do		T. M. Staton, Tarboro, N. C.
1808	do		Staton & Dawson, Bethel, N. C.
1807	do		O. K. Taytol, Scotland Neck, N. C.
1879	do		D. W. Thorpe, Rocky Mount, N. C.
1785	do		do
1796	do		L. E. Tyner & Son, Lowe, N. C.
1825	do		R. A. Tyson, Greenville, N. C.
1811	do		Harry Waldo, Hamilton, N. C.
1828	do		R. C. Warren, Conetoe, N. C.
1827	do		do
1763	do		H. D. Wilson, Shelby, N. C.
1779	do		J. W. Quinnerly, Ayden, N. C.

MISCELLANEOUS COTTON-SEED MEAL.

Laboratory Number.	Date of Purchase, 1903.	Per cent Ammonia.	Per cent Protein.	Per cent Fat.	Per cent Ash.	Per cent Crude Fiber.	Remarks.
1823		8.25	42.50				
1822		8.02	41.31				
1847		7.48	38.50				Below standard.
1775		8.83	45.44				
1774		7.54	38.81				
1820		7.82	40.25				
1826		7.78	40.06				
1804		7.40	38.12				Below standard.
1755		8.13	41.87				
1756		7.26	37.37				Below standard.
1870		7.94	40.87				
1843		7.20	37.06				Below standard.
1875		7.64	39.37				
1850		7.64	39.37				
1821		8.27	42.56				
1842		8.37	43.12				
1808		8.15	41.94				
1807		6.94	35.75				Below standard.
1879		7.31	37.62				do.
1785		7.50	38.62				
1796		7.28	37.50				Below standard.
1825		8.08	41.62				
1811		7.21	37.12				Below standard.
1828		8.31	42.75				
1827		8.28	42.62				
1763		7.28	37.50				Below standard.
1779		8.18	42.12				

DISCUSSION OF RESULTS.

Wheat Bran is a by-product from the manufacture of flour. To be of good quality it should contain 15½ per cent of protein. Of the thirty-seven (37) samples of wheat bran analyzed, twenty-one (21), or 56 per cent, contained less than 15½ per cent of protein, and are, therefore, not up to full standard quality. Some of the others contained as much as 17 per cent protein. One of the brans contained only 10.87 per cent protein and does not have over two-thirds the feeding value of good bran. Ten of the wheat brans contained corn bran mixed with them, which reduces their feeding value in proportion to the amount added, as corn bran does not have near the feeding value of good wheat bran. Corn bran, when mixed with wheat bran or other wheat products, is an adulterant forbidden by law, unless the material is sold as mixed feed or mixed wheat and corn bran, in which case a guarantee is required.

A study of these analyses reveals the manufacture of good bran.

Shorts.—Six samples of shorts were examined, and while they are a wheat product, they vary a great deal in composition and feeding value. Some of them contain as high as 18 per cent protein, others running as low as 12 per cent, and are consequently of much less feeding value.

Wheat Middlings.—The terms "middlings" and "shorts" are used interchangeably to some extent. Some of the middlings have been found to be made up of reground bran and occasionally mixed with other products. Middlings are rich in protein and low in fiber, and for this reason are very excellent feed for hogs. Of the seven samples analyzed nearly all were of excellent quality.

Peanut Middlings.—One sample, No. 2468, of this product, manufactured by the Phœnix Mills, Petersburg, Virginia, contained only 8.8 per cent protein, nearly 40 per cent of fiber and over 18 per cent of ash. It is therefore made up largely if not entirely of ground peanut shells and has very little feeding value.

Shipstuff.—Fifty samples of shipstuff were examined. Twenty-four of these were all wheat products and a majority of the others used wheat bran or middlings as the base of the mixtures, the other portions being corn bran, rice chaff, peanut hulls, corn meal, etc. These products were found to vary very much in composition and in the purchase of them the dealer and the feeder should exercise more than usual care to see that they have a guarantee of a good per cent of protein. Samples Nos. 2405, 1970 and 2471, manufactured by the Richmond Flour and Feed Company, contained very large amounts of rice chaff, which reduced their feeding value very materially.

Sample No. 2457, South Boston Grocery Company (Jobbers), South Boston, Va., contained a very large amount of fiber, on account of the presence of peanut hulls and rice chaff.

Sample No. 1958, Atlanta Milling Company, Atlanta, Ga., was also high in fiber because of the presence of a large amount of rice chaff, and sample No. 2478, Carolina Milling Company, of Weldon, also contained peanut hulls. Samples Nos. 1899 and 1764 were also adulterated and reduced in value.

Miscellaneous Feeds.—Under this head ten samples were examined, all of them being of reasonably good grade.

Cotton-seed Meal.—Good grades of cotton-seed meal contain 43 per cent or more protein. This means that they have about 7 per cent of nitrogen, which is equal to 8.50 per cent of ammonia. Meals in past years especially have not infrequently been considerably higher than this. 123 samples of cotton-seed meal were examined; 102 of these contained as much or more protein as required by the standard of 7.50 per cent ammonia, which equals 38.62 per cent of protein; 82 of the samples contained more than 40 per cent of protein, and quite a number more than 43 per cent; 21 samples were below the legal standard, and three contained only 5.03, 4.65 and 4.72 per cent of ammonia.

GENERAL STATEMENT.

In the margin to the right of the tables is found the result of the microscopic examination of the various products. In addition to the materials referred to under the several heads the following are either low grade or contain admixtures of low grade materials which do not properly belong with the products sold under the several names:

No. 1988—Chops.
No. 2415—Victor Feed.
No. 2410—Royal Feed.
No. 1989—Corn and Oat Feed.
No. 1871—Corn and Oat Feed.
No. 1882—Mill Feed.
No. 2484—Mill Feed.
No. 2468—Peanut Middlings.
No. 1872—Rice Meal.
No. 2485—Rice Product.

ADULTERANTS.

When mixed with other good feeding materials without proper labelling or guarantee to indicate their presence, corn bran, rice chaff, ground corn cobs, peanut hulls, peanut middlings and other similar products are adulterants. The tables containing the chemical and microscopic examinations show that these adulterants are being used quite freely in the make-up of the feeds sold for stock in the State. To convey an idea of the real feeding value of these adulterants, the following analyses were made. It will be observed that they are very low in protein, with the exception of corn bran, and extremely high in fiber. Their feeding value is therefore extremely low.

	Per cent Protein.	Per cent Fat.	Per cent Ash.	Per cent Fiber.
Peanut Hulls	4.56	0.81	2.17	67.31
Peanut Middlings	8.75	0.88	16.75	40.75
Corn Bran	10.81	8.32	2.98	10.11
Ground Corn Cobs	3.12	0.32	2.19	30.37
Rice Chaff	2.50	0.31	18.37	34.40
Cotton-seed Hulls	4.75	1.59	3.20	40.54

FOURTH REPORT ON FOOD PRODUCTS FOR 1903.

By B. W. Kilgore, State Chemist.

During the year 1903 four hundred and seventy-seven samples of human foods and drinks, which were obtained in forty-one towns and cities of the State, were analyzed. One hundred and thirty-three, or 32 per cent, were found to be sophisticated. The reports for 1902, 1901 and 1900 showed 21.3, 35.7 and 56.4 per cent of adulteration respectively.

As will be observed from the summary which follows, the sophistication reported for this year (1903), is confined in the main to catsups, sauces, jams, jellies, preserves, alcoholic and nonalcoholic drinks.

PLACES AT WHICH SAMPLES WERE OBTAINED, AND NUMBER OBTAINED AT EACH PLACE, FOR 1903.

Asheville	10
Blowing Rock	1
Charlotte	14
Concord	10
Conover	3
Elizabeth City	35
Edenton	13
Fayetteville	3
Friezland	1
Greensboro	32
Guilford College	1
Goldsboro	1
High Point	22
Henderson	17
Hookerton	1
Hickory	3
Kinston	15
Lexington	18
Lincolnton	9
Littleton	28
Louisburg	2
Monroe	5
Mt. Olive	2
Maxton	1
Mocksville	3
New Bern	39
Newton	9
Nashville	1
Oxford	14
Raleigh	26
Rockingham	34
Roxboro	18
Reidsville	15
Salisbury	21
Seaboard	3
Statesville	5

Thomasville	9
Tarboro	1
Winston	12
Wadesboro	4
Walkertown	1
Not stated	15
Total	477

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS FOR 1903.

Kinds of Samples.	Total Number of Samples.	Not Found Adulterated.	Found Adulterated.	Per cent Adulterated.	Kind of Adulteration.
Vinegar	62	44	18	29	Untrue to name.
Catsups and sauces	49	0	49	100	Coal-tar colors and preservatives.
Sugar, white	29	29	0	0	
Sugar, brown	16	16	0	0	
Molasses	11	8	3	37.5	Glucose.
Maple syrup	4	3	0	0.0	
Honey	6	4	2	33.3	Invert sugar.
Flour	77	77	0	0.0	
Corn meal	23	23	0	0.0	
Breakfast foods	20	20	0	0.0	
Tapioca	3	3	0	0.0	
Jellies	30	7	23	76.6	Coal-tar dyes and preservatives, glucose.
Jams	14	3	11	78.4	Coal-tar dyes and preservatives, glucose.
Marmalades	3	3	0	0.0	
Apple butter	1	1	1	100	Coal-tar dye and preservative.
Preserves	20	5	15	75	Coal-tar dye, preservatives and glucose.
Phosphates, malts, wines, beers, whiskeys, ciders, tonics.	30	11	19	63.3	Preservatives, coal-tar dye, untrue to name.
Non-alcoholic drinks	20	15	5	25	Preservatives.
Coffee (roasted whole berries)	38	38	0	0.0	
Tea	21	14	7	33.3	Below standard, Prussian blue facing.
Total	477	324	153	32.1	

For convenience of comparison of the work for the four years, and to show at a glance the products which have been examined, and the extent of adulteration of each, the tables of summary results are given below for 1900, 1901 and 1902.

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS FOR 1900.

	Total Number of Samples.	Not Found Adulterated.	Found Adulterated.	Per cent Adulterated.
Beers and other alcoholic drinks	35	8	27	77.14
Breakfast foods	24	23	1	4.17
Butter	11	11		
Canned Asparagus	9	2	7	77.77
Boston baked beans	1		1	100
Celery	2		2	100
Corn	70	28	42	60
Corn and tomatoes	4		4	100
Garden peas	37	7	30	81
Lima beans	8	3	5	62.50
Okra	2	1	1	50
Okra and tomatoes	8		8	100
Pumpkin	8	4	4	50
Snap beans	9	2	7	77.77
Succotash	14	13	1	7.14
Tomatoes	55	20	35	63.63
Catsups	36	1	35	97.22
Flour	37	37		
Lard	11	10	1	9
Non-alcoholic summer drinks	33	9	24	72.72
Oil	11	9	2	18.18
Sauces	7	1	6	86
Vinegar	22	9	13	59
Total human foods	454	187	256	56.04
Commercial stock feeds	53			
Total	507			

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS FOR 1901.

	Total Number of Samples.	Not Found Adulterated.	Found Adulterated.	Per cent Adulterated.
Baking powders	35	69	16	18.8
Coffee	55	35	20	36.3
Condiments	44	35	9	20.4
Jams, fruit butters and preserves	25	.....	25	100
Jellies	10	.....	10	100
Molasses, syrups and honey	32	6	26	81.2
Sugar	19	19	.....	.....
Tea	25	25	.....	.....
Vinegar	13	9	4	30.7
Total	308	198	110	35.7

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS FOR 1902.

	Total Number of Samples.	Not Found Adulterated.	Found Adulterated.	Per cent Adulterated.
Baking powders	12	12	.....	.....
Butter and butterine (oleomargarine)	22	22	.....	.....
Canned fruits and vegetables	118	102	16	13.5
Cheese	33	31	1	6
Corn meal	17	17	.....	.....
Compound lard	24	24	.....	.....
Lard	32	31	1	3.1
Flour	70	69	1	1.4
Non-alcoholic summer drinks	36	10	26	72
Phosphates, malts, ciders and bitters	12	3	9	75
Prepared mustards and salad dressings	11	1	10	90.9
Tomato catsup and sauces	22	.....	22	100
Total human foods	409	322	87	21.3
Commercial stock feeds	162			
Condimental stock feeds	18			
Total	589			

BRIEF STATEMENT OF RESULTS FOR 1903.

VINEGAR.

A total of sixty-two samples were analyzed. Eighteen, or 29 per cent, were not sold under their true name. Forty were sold as cider vinegar, but only eleven, or 27 per cent, came up to the standard of genuine cider vinegar; the others showed a slight deficiency of one kind or another.

CATSUPS AND SAUCES.

Thirty-three catsups and sixteen sauces, or all that were tested, were found to contain, without exception, both coal-tar colors and preservatives.

SUGAR.

All the samples of white sugar (twenty-nine) were found to be of high unadulterated quality. They came up to the standard per cent of sucrose, namely, 99.5 per cent. No adulteration was detected in the brown sugars (sixteen samples examined); their content of sucrose ranged from 83 to 95 per cent.

MOLASSES.

Three out of eleven samples claiming to be molasses contained glucose; two of the three claimed to be respectively "Open-kettle Molasses" and "Olden-times Sugar-house Molasses."

MAPLE SYRUP.

Four samples: all may be genuine.

HONEY.

Six samples: two genuine, two apparently containing artificially-added invert sugar, and two sold as *compound honey* and containing glucose.

FLOUR.

Seventy-seven samples: no adulteration found.

CORN MEAL.

Thirty-three samples: no adulteration found.

BREAKFAST FOODS.

Twenty samples: no adulteration found.

TAPIOCA.

Three samples: all genuine.

JAMS, JELLIES, MARMALADES, APPLE BUTTER, PRESERVES.

Sixty-eight samples: thirty-seven, or 54 per cent, contained coal-tar dyes as coloring matter; thirty-two, or 47 per cent, contained benzoic acid, and five, or 7.4 per cent, salicylic acid; forty-one samples do not claim (or admit) the presence of glucose, but thirty-three, or 80.5 per cent of the forty-one, were found to contain glucose; sixty samples, or 88 per cent of the whole, including the twenty-seven sold as compound, contained glucose as the main sweetener.

PHOSPHATES, MALTS, WINES, BEERS, WHISKIES, CIDERS AND TONICS.

Thirty samples were tested.

Four samples sold as soft or nonalcoholic drinks contained alcohol, ranging from 2.63 to 15.85 per cent.

Nineteen samples contained salicylic acid as preservative and three of them in very large quantity.

Two samples of wine were apparently artificial wines, one of them being colored with coal-tar dye.

One sample of whiskey was apparently doctored with potash lye to give it bead.

NONALCOHOLIC DRINKS.

(See also the preceding).

Twenty samples: three samples contained salicylic acid, two formaldehyde, together five samples, or 25 per cent; three samples, or 15.5 per cent, were colored with coal-tar dyes.

COFFEE.

(Whole berries, roasted).

Thirty-eight samples: sixteen samples, or 42 per cent, contained more or less of coffee stems, bits of wood, small pebbles, etc.

Contained broken and damaged coffee:

Three samples	none.
Eleven samples	1 to 2 per cent.
Nine samples	4 to 6 per cent.
Thirteen samples	7 to 10 per cent.
Two samples	14 to 24 per cent.

Contained immature coffee:

Three samples	none.
Thirteen samples	less than 4 per cent.
Fourteen samples	4 to 6 per cent.
Seven samples	7 to 11 per cent.
One sample	26 per cent.

TEA.

Twenty-one samples: two samples (5.5 per cent) were faced with Prussian blue; two samples and five samples, together seven, or 33.3 per cent, fell below the standard in hot water extract and soluble ash respectively, indicating weak or possibly artificially exhausted leaves; but the deficiency was only slight.

On the following pages are detailed the results of the analyses of the several classes of foods, credit being given in each case to the chemists who did the laboratory work, the discussions being generally the combined work of the analyst and the State Chemist.

VINEGAR.

By W. M. Allen.

Vinegar is an acid liquid, in which acetic acid is the principal constituent, but also contains small amounts of alcohol, ethyl acetate or acetic ether, aldehyde, sugar, gums, extractive matter, alkalin acetates and tartrates, and various small amounts of other salts, depending on the substance from which it was produced. It is the result of either the acetous fermentation of dilute or weak solutions of alcohol, or the distillation of wood. When pure alcohol is exposed to the air it undergoes no change, but if fermented liquors, which contain nitrogenous substances, be exposed to the air, acetous fermentation sets in, which oxidizes the alcohol and forms acetic acid. A very small amount of alcohol is left after the fermentation ceases, which is regarded as desirable, improving both the flavor and keeping qualities. Some mineral acid, as sulphuric or hydrochloric acid, was formerly thought to be necessary as a preservative, but such is not the case and is now condemned as an adulteration. Sulphuric acid was mostly used, and rarely hydrochloric acid.

Vinegar is often made by spontaneous fermentation, but is oftener produced by passing the dilute alcohol over beech shavings or birch twigs, impregnated with the acetic ferment, principally *Mycodermi aceti*, a regulated supply of air being maintained at the same time. When treated in this way the conversion of the alcohol into acetic acid takes place rapidly.

Varieties of Vinegar.—The principal varieties of vinegar are cider vinegar, wine vinegar, malt vinegar, spirit vinegar and wood vinegar.

Cider Vinegar is a brownish liquid, containing about 4 per cent of acetic acid, and about 2 to 2.50 per cent of solids, which, when extracted and heated has the odor and taste of baked apples. The solids in an apple cider vinegar are precipitated from the solution by acetate of lead, removing at the same time most of the coloring matter from the solution. Artificial coloring matter, such as caramel, is not removed by the precipitation with the lead acetate.

Cider vinegar is made by the fermentation of the juice of apples, and is the most desirable and choice kind of vinegar because of its flavor, which is largely due to the small amount of alcohol and acetic ether it contains. It commands the highest price on the market, and is, therefore, often imitated, and oftener adulterated with other vinegars. Spirit vinegar colored with caramel is often sold for apple cider vinegar, in fact various other vinegars are frequently sold under its good name.

Wine Vinegar is the chief vinegar in continental commerce, and, with the single exception of apple cider vinegar, is most desirable.

It is produced by the acetous fermentation of grape juice and inferior new wines, that made from white wine being most esteemed. The wine vinegars vary in color from almost colorless, through pale yellow to red, and contain a large amount of tartrates, by which they are easily distinguished from other vinegars. Wine vinegar contains about 4.50 per cent of acetic acid, 2.00 per cent solid matter, of which about 3.50 per cent is acid potassium tartrate.

Malt Vinegar is derived from the acetous fermentation of a wort, made from mixtures of malt and barley. It has a decided dark-brown color, and is characterized by a comparatively large amount of nitrogenous matter, which is

precipitated by acetate of lead, without removing the coloring matter. It varies in strength, usually containing about 5 to 6 per cent acidity, and 2.50 per cent solid matter, in solution, the ash from which contains very little, if any, alkalin carbonates, but a good deal of phosphoric acid.

Distilled Spirit Vinegar is made from a dilute or weak solution of alcohol, which is usually obtained by distilling a fermented mash of grain. Such a solution is sometimes called "low wine," which may be converted, without rectification or concentration, into vinegar, by the quick method described above. Spirit vinegar is usually strong in acidity, has very little flavor, and is colorless or nearly so. It is often colored with caramel, and sometimes with strongly scorched malt, to simulate cider vinegar and malt vinegar. A pure spirit vinegar contains very little solid matter, and the ash never more than a trace of phosphates or alkalin carbonates.

Adulteration.—The chief adulterants of vinegar are water and mineral acids, some metallic salts and coloring matters. The principal and almost only coloring material used in vinegar is caramel, which in itself is harmless, and is objectionable only because of the deception it enables the dealer to practice; that is, color a spirit vinegar and sell it for a cider or malt vinegar, a form of adulteration that is much practiced among retail dealers.

Examination of Samples.—Sixty-two samples were collected by an agent of the Department of Agriculture, and analyzed.

By reference to the table below containing the results, it will be seen that forty of them were claimed to be and were sold for cider vinegars; twenty-seven of them appear to be true to name, though eleven of them are deficient in acidity only, indicating, probably, incomplete fermentation. Five are deficient in acidity and solids, indicating the addition of water, and five others are deficient in solids only, indicating the addition of spirit vinegar, which would keep the acidity near normal, but would reduce the solid matter in proportion to the amount added. In one way or another sixteen of these twenty-seven samples which pass for cider vinegar, are deficient, which leaves eleven only of good standard quality apple cider vinegar, out of the forty; thirteen of them having no indication of cider vinegar at all.

A good cider vinegar ought to have at least 4 per cent acetic acid and about 2 per cent or more of apple solids. Thus, out of forty samples which were claimed to be cider vinegar, there were eleven only, or about 27.5 per cent of the number, that are standard apple cider vinegars.

Sample No. 1625, was claimed to be a compound of apple cider and white wine vinegar. It proved to be apple cider and spirit vinegar. No. 1650 was claimed to be a pure cider vinegar, and proved to be cider and spirit vinegar. No. 1632 was claimed to be a compound containing apple cider vinegar, but proved to be a distilled spirit vinegar colored.

Nos. 1651 and 1657 were claimed to be white wine vinegar, the next most desirable to a cider vinegar, but proved to be spirit vinegars.

Of the sixty-two samples 18, or 29 per cent, of them were not sold under their true names.

METHODS OF ANALYSIS.

The provisional methods of the Association of Official Agricultural Chemists were employed.

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1625	Homemade	Bunney, Gastonia, N. C.	Hiatt & Lamb, Greensboro, N C.
1626	Heinz Cider	H. J. Heinz & Co., Pittsburg, Pa.	do
1627	Country		Fletcher & Rhodes, Greensboro, N. C.
1628	Country (apple)		Tucker & Erwin, Greensboro, N. C.
1629	Apple		S. E. Hudson, Greensboro, N. C.
1630	Monogram	R. M. Hughes & Co., Louisville, Ky.	J. R. Foster & Co., Greensboro, N. C.
1631	Apple	Hirsch Bros. & Co., Louisville, Ky.	C. E. Pugh, Greensboro, N. C.
1632	Compound (apple flavor).		R. A. McCracken, Greensboro, N. C.
1633			J. E. Sockwell, Greensboro, N. C.
1634	Blue Grass Belle	Jones Bros. & Co., Louisville, Ky.	
1635	Elko	O. L. Gregory Vinegar Co., Paducah, Ky.	A. P. Grizzard, Winston, N. C.
1636		J. Weller & Co., Cincinnati, O.	S. O. Bennet, Winston, N. C.
1637	Elko	O. L. Gregory Vinegar Co., Paducah, Ky.	C. J. Jeffries, Salisbury, N. C.
1638	Heinz Distilled Pickling.	H. J. Heinz & Co., Pittsburg, Pa.	do
1639	Albemarle (apple)	Antrim & Son, Richmond, Va.	Ruffity & Meisenhamer, Salisbury, N. C.
1640	Family	Hirsch Bros. & Co., Louisville, Ky.	Steel & Griggs, Salisbury, N. C.
1641	Apple	do	do
1642	do	Price & Lucas, Louisville, Ky.	W. M. Harris & Co., Salisbury, N. C.
1643	Apple (4 years old)	do	L. F. Hanley, Salisbury, N. C.
1644	do	do	J. A. Bennett, Salisbury, N. C.
1645		do	D. L. Cauble, Salisbury, N. C.
1646	Thompson's Country Apple.	Thompson, Salisbury, N. C.	M. Moses, Salisbury, N. C.
1647	Distilled Colored	Hirsch Bros. & Co., Louisville, Ky.	do
1648	Heinz Pure Malt	H. J. Heinz & Co., Pittsburg, Pa.	W. H. Wallace, Salisbury, N. C.
1649	Apple Cider	Vinegar Works, Proffit, Va.	S. H. Youngblood, Charlotte, N.C.
1650	Cider Vinegar	Philadelphia Pickling Co., Philadelphia, Pa.	J. R. Van Ness & Bro., Charlotte, N. C.
1651	White Wine	H. J. Heinz & Co., Pittsburg, Pa.	do
1652	Blue Grass Belle	Jones Bros. & Co., Louisville, Ky.	do
1653	Apple Cider	Mrs. Smith, Proffit, Va.	W. L. Pope, Charlotte, N. C.
1654	Pure Apple Cider	L. Elmer & Sons, Baltimore, Md.	N. Duls, Charlotte, N. C.
1655	Apple Cider	Mrs. Smith, Proffit, Va.	J. M. Sims, Charlotte, N. C.

NATION OF VINEGAR.

Laboratory Number.	Retail Price per Gallon.	Total Acidity (acetic acid)—per cent.	Total Solids—per cent.	Ash—per cent.	Phosphoric Acid in 100 c. c.—Mgs.	Ash Contained.	Lead Acetate.	Coloring Matter.	The indications are that this is—
1625	$ .30	5.20	1.10	.245	14.5	Potash, carbon dioxide.	Precipitate.	-------	Compound apple cider and distilled spirit vinegar.
1626	.35	6.27	2.33	.235	24.0	----do----------	--do----	-------	Apple cider vinegar.
1627	.20	5.01	1.70	.259	24.0	----do----------	--do----	-------	Apple cider vinegar, deficient in solids, indicating addition of spirit vinegar.
1628	.30	3.55	2.18	.269	24.0	----do----------	--do----	-------	Apple cider vinegar, deficient in acidity, indicating incomplete fermentation.
1629	.30	5.10	1.99	.175	10.0	----do----------	--do----	-------	Apple cider vinegar.
1630	.30	4.40	0.39	.050	trace	----------	--------	Caramel.	Distilled spirit vinegar, colored.
1631	.30	4.88	0.25	.085	trace	----------	--------	-do ---	do.
1632	.25	4.61	0.30	.020	trace	----------	--------	-do ---	do.
1633	.25	2.23	0.54	.020	------	----------	--------	-------	Distilled spirit vinegar.
1634	.30	3.87	1.22	.282	14.0	----do----------	--do----	-------	Apple cider vinegar, little deficient in acidity and solids, indicating the addition of water.
1635	.20	4.62	1.62	.200	10.0	----do----------	--do----	-------	Apple cider vinegar, little deficient in solids, indicating the addition of spirit vinegar.
1636	.25	4.62	0.22	.017	------	----------	--------	-do ---	Distilled spirit vinegar, colored.
1637	.30	4.62	1.60	.160	14.2	----do----------	--do----	-------	Apple cider vinegar, little deficient in solids, indicating the addition of spirit vinegar.
1638	.40	5.22	1.68	.042	------	----------	--------	-------	Distilled spirit vinegar.
1639	.25	3.86	2.84	.290	14.1	----do----------	--do----	-------	Apple cider vinegar, little deficient in acidity.
1640	.20	2.86	0.26	.077	trace	----------	--------	-------	Distilled spirit vinegar, colored, deficient in acidity.
1641	.25	3.56	0.26	.047	trace	----------	--------	-do ---	do.
1642	.25	3.00	0.25	.030	trace	----------	--------	-do ---	do.
1643	.20	3.13	0.27	.060	------	----------	--------	-do ---	do.
1644	.20	3.89	0.32	.030	trace	----------	--------	-do ---	do.
1645	.20	3.25	1.15	.126	10.0	----do----------	--do----	-------	Apple cider vinegar, deficient in acidity and solids, indicating the addition of water.
1646	.30	3.22	1.58	.391	12.5	----do----------	--do----	-------	do.
1647	.20	3.50	0.30	.092	trace	----------	--------	-do ---	Distilled spirit vinegar, colored, deficient in acidity.
1648	1.00	6.13	2.57	.215	24.7	----------	--do----	-------	Malt vinegar.
1649	.30	3.49	4.47	.430	21.2	----do----------	--do----	-------	Apple cider vinegar, deficient in acidity only, indicating incomplete fermentation.
1650	1.00	7.00	1.77	.166	11.7	----do----------	--------	-------	Compound apple cider and distilled spirit vinegar.
1651	.40	3.85	0.48	.105	6.2	----------	--------	-------	Distilled spirit vinegar, little deficient in acidity.
1652	.35	4.64	2.30	.452	20.5	----do----------	--do----	-------	Apple cider vinegar.
1653	.40	3.50	3.70	.487	20.3	----do----------	--do----	-------	Apple cider vinegar, deficient in acidity only, indicating incomplete fermentation.
1654	.35	3.79	0.40	.060	3.0	Trace potash ---	--------	-do ---	Distilled spirit vinegar, colored, deficient in acidity.
1655	.35	3.60	3.68	.502	22.0	Potash, carbon dioxide.	--do----	-------	Apple cider vinegar, deficient in acidity indicating incomplete fermentation.

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1656	Blue Grass Belle	Jones Bros. & Co., Louisville, Ky.	Old & Fearing, Elizabeth City, N. C.
1657	White Wine	do	do
1894	Pure Malt	H. J. Heinz & Co., Pittsburg, Pa.	A. P. Grizzard, Winston, N. C.
2793	Apple Cider	Hirsch Bros. & Co., Louisville, Ky.	W. B. Mann, Raleigh, N. C.
1895	do	Jones Bros. & Co., Louisville, Ky.	E. N. Pool, Raleigh, N. C.
2796	do	Hirsch Bros. & Co., Louisville, Ky.	W. B. Mann, Raleigh, N. C.
2797	do	do	do
2039	Tarragon	Cross & Blackwell, London	E. B. Hackburn, New Bern, N. C.
2040	Country Apple Cider	W. H. Idol, High Point, N. C.	J. W. Harris & Co., High Point, N. C.
2041	Pure Malt	H. J. Heinz & Co., Pittsburg, Pa.	P. H. Johnson, High Point, N. C.
2042	Apple	Price & Lucas, Louisville, Ky.	Lexington Grocery Co., High Point, N. C.
2043	Apple Heinz Pure	Heinz & Co., Pittsburg, Pa.	W. H. Moffitt & Co., High Point, N. C.
2044	do	do	P. H. Johnson, High Point, N. C.
2045	do	do	D. C. Moffitt, Thomasville, N. C.
2046	do	R. M. Hughes, Louisville, Ky.	Fouts & Grimes, Thomasville, N. C.
2047	do	Merchants Grocery Co., Greensboro, N. C.	J. M. Morris & Son, Thomasville, N. C.
2579	Pure Malt	H. J. Heinz & Co., Pittsburg, Pa.	Bruner & Huey, Monroe, N. C.
2580	Elko	O. L. Gregory & Co., Paducah, Ky.	McKee, Son & Co., Lincolnton, N. C.
2581	Pure Apple	W. L. Thomas, Asheville, N. C.	J. F. Smyre, Newton, N. C.
2582	do		W. P. Ware, Reidsville, N. C.
2583	do		A. R. Foushee, Roxboro, N. C.
2584	Apple Cider	H. J. Heinz & Co., Pittsburg, Pa.	J. S. Brown, Oxford, N. C.
2585	do	O. L. Gregory Cider and Vinegar Works, Paducah, Ky.	C. A. Carroll, Oxford, N. C.
2631	do	J. R. Clark, Baltimore, Md.	A. O. Bush, Edenton, N. C.
2632	do	J. F. Shull & Co., Philadelphia, Pa.	A. B. Seely & Sons, Elizabeth City, N. C.
2633	Apple	Burr Manufacturing Co., Richmond, Va.	Foxey & Gallop, Elizabeth City, N. C.
2919	Apple Cider	Jones Bros. & Co., Louisville, Ky.	D. T. Johnson & Son, Raleigh, N. C.
2508	do		R. B. Peters Grocery Co., Tarboro, N. C.
2886	Apple	Price & Lucas, Louisville, Ky.	J. A. Newberry, Rockingham, N. C.
2887	Cider	Louisville Cider and Vinegar Works, Louisville, Ky.	J. R. Smith, Rockingham, N. C.
2888	Apple Cider		H. H. Smith, Rockingham, N. C.

TION OF VINEGAR—CONTINUED.

Laboratory Number.	Retail Price per Gallon.	Total Acidity (acetic acid)—per cent.	Total Solids—per cent.	Ash—per cent.	Phosphoric Acid in 100 c. c.—Mgs.	Ash Contained.	Lead Acetate.	Coloring Matter.	The indications are that this is—
1656	$ .32	4.67	2.32	.350	19.5	Potash, carbon dioxide.	Precipitate.	-------	Apple cider vinegar.
1657	.32	5.15	0.19	.047	3.0	-------	-------	-------	Distilled spirit vinegar.
1894	1.00	6.16	2.57	.215	26.0	Trace potash	do	-------	Malt vinegar.
2793	-----	3.98	0.30	.060	trace	-------	-------	Caramel.	Distilled spirit vinegar, colored, little deficient in acidity.
1895	.35	5.01	2.59	.375	19.5	Potash, carbon dioxide.	do	-------	Apple cider vinegar.
2796	-----	3.76	1.79	.200	22.3	-------	do	-------	Apple cider vinegar, deficient in acidity and solids, indicating the addition of water.
2797	-----	3.89	0.34	.060	trace	-------	-------	do	Distilled spirit vinegar, colored, little deficient in acidity.
2039	.30	5.25	2.45	.460	26.3	do	do	-------	Apple cider vinegar.
2040	-----	2.99	1.95	.400	16.2	do	do	-------	Apple cider vinegar, deficient in acidity and solids.
2041	1.00	5.84	2.52	.211	24.1	Trace potash	do	-------	Malt vinegar.
2042	.25	4.04	0.35	.100	trace	-------	-------	do	Distilled spirit vinegar, colored.
2043	.30	4.74	2.75	.210	10.2	Potash, carbon dioxide.	do	-------	Apple cider vinegar.
2044	.30	4.62	2.66	.237	9.5	do	do	-------	do.
2045	.30	4.62	0.41	.037	trace	-------	-------	do	Distilled spirit vinegar, colored.
2046	.25	4.03	0.25	.065	-----	-------	-------	do	do.
2047	-----	3.16	0.38	.022	-----	-------	-------	do	Distilled spirit vinegar, colored, deficient in acidity.
2579	1.00	5.88	2.44	.212	24.2	-------	do	-------	Malt vinegar.
2580	.35	4.41	2.48	.345	17.0	do	do	-------	Apple cider vinegar.
2581	.80	2.95	1.57	.338	9.2	do	do	-------	Apple cider vinegar, deficient in acidity and solids, indicating addition water.
2582	.40	4.00	1.60	.135	10.0	do	do	-------	Apple cider vinegar, deficient in solids, indicating addition of spirit vinegar.
2583	.80	4.08	0.34	.056	1.0	-------	-------	do	Distilled spirit vinegar, colored.
2584	.80	4.64	2.79	.316	12.0	do	do	-------	Apple cider vinegar.
2585	.48	5.10	1.72	.222	12.0	do	do	-------	Apple cider vinegar, deficient in solids, indicating addition of spirit vinegar.
2631	.30	4.16	0.56	.047	trace	-------	-------	do	Distilled spirit vinegar, colored.
2632	.15	4.24	2.48	.225	-----	do	-------	-------	Not an apple cider vinegar; was made by fermenting some saccharine material.
2633	.25	4.35	0.25	.015	-----	-------	-------	do	Distilled spirit vinegar, colored.
2919	-----	4.00	2.02	.342	16.0	do	do	-------	Apple cider vinegar.
2508	-----	4.04	2.22	.165	20.0	do	-------	-------	Not an apple cider vinegar; was made by fermenting some saccharine material.
2886	.30	3.91	0.29	.053	1.3	-------	-------	do	Distilled spirit vinegar, colored.
2887	.35	3.52	0.40	.083	1.0	-------	-------	do	do.
2888	.30	6.03	0.47	.078	1.0	-------	-------	do	do.

TOMATO CATSUP AND SAUCES.

By W. M. Allen.

Tomato catsup, or ketchup, as prepared in the home for family use, consists of ripe tomatoes boiled down to the desired consistency and strained to remove seeds and skin. The strained pulp is then further cooked with vinegar, spices and other flavoring matters.

Sauces are prepared in a similar way, but with the addition of more vinegar and pepper. Both sauces and catsups are bottled while hot, and closed, to kill and exclude germs. The sterilization and sealing are not always perfect, and the contents of the bottles are prevented from fermenting and spoiling chiefly by virtue of the spices and vinegar. Carefully and well prepared catsups and sauces will keep for months while bottled, and for several weeks after opening.

Catsups and sauces are quite popular and very extensively used, the commercial product being found on the tables of nearly every hotel and restaurant, and are consumed in large quantities in families.

Some of the commercial catsups and sauces are made of good materials, but others are said to be made from the refuse of tomato canneries or other inferior materials, and most of them are colored with dyes and preserved with chemical preservatives. In coloring, magenta, eosine, ponceau, tropeolin and other dyes of coal-tar and other origin are used. They give the catsups a brilliant red color, and those who are unaware that the genuine uncolored goods have a dull red color believe it is the natural color of the fruit.

The objections to the use of artificial colorings are many. They deceive the purchaser; some of them are injurious to health; they may serve to hide dirt and disguise inferior and unwholesome materials. They put the pure, uncolored product at a disadvantage and in no way improve the quality of the product.

The chemical preservatives commonly employed are salicylic acid and benzoic acid, the latter being frequently and largely used. The subject of preservatives in food products has already been discussed several times in these food reports.

Thirty-three samples of catsups and sixteen samples of sauces were collected from the markets of North Carolina and examined. Each and every one of them contains both a chemical preservative and an artificial coloring matter. The chemical preservative in some of these was in exceedingly large quantities, especially the benzoic acid in some of the samples, and the salicylic acid in sample No. 2057. There may be some little excuse for using a small amount of chemical preservative in this class of goods, as they are likely to remain open for some time, and a catsup would be better in good condition, preserved with a reasonable amount of a chemical preservative, than one in bad condition not preserved; but if a catsup is anything like properly put up with vinegar and spices a very small amount of either benzoic acid or salicylic acid is sufficient to keep it in good condition, and with plenty of the proper ingredients no chemical preservative is necessary, much less the enormous amount that is used.

These catsups and sauces were not only chemically preserved, for which there may be some little excuse, but they were all artificially colored, for which there can be no just reason at all, for it does not add in any way to the quality of the catsup. These samples were not only artificially colored, but were colored with the most objectionable coloring materials, those known as coal-tar dyes.

The results of the examination are given in the table below.

METHODS OF ANALYSIS.

The provisional methods of the Association of Official Agricultural Chemists were employed.

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2018	Royal Scarlet	R. C. Williams & Co., New York	P. H. Johnson, High Point, N. C.
2019	Heinz Ketchup	Heinz & Co., Pittsburg, Pa.	do
2020	Chutney Heinz Tomato.	do	do
2021	Admiral	Knadler & Lucas, Louisville, Ky.	W. H. Moffitt, Lexington, N. C.
2022	Famous	Helwig Bros. & Tuer, Baltimore, Md.	do
2024	Premier	F. H. Leggett & Co., New York	Cannon & Fetzer Co., Concord, N. C.
2060	Oyster Cocktail	Dodson Braum Manufacturing Co., St. Louis, Mo.	E. B. Hackburn, New Bern, N. C.
2066	Tomato	Anderson Preserving Co., Camden, N. J.	do
2059	Blue Label	Curtice Bros. Co., Rochester, N. Y.	do
2067	Violet	Sharp Canning Co., Williamston, N. J.	do
2511	Tomato Heinz	H. J. Heinz Co., Pittsburg, Pa.	W. I. Everett Rockingham, N. C.
2519	Blue Label	Curtice Bros. Co., Rochester, N. Y.	J. F. Smyre, Newton, N. C.
2522	Heinz Tomato	H. J. Heinz Co., Pittsburg, Pa.	Nash & McGehee, Newton, N. C.
2524	Admiral	Knadler & Lucas, Louisville, Ky.	W. P. Ware, Reidsville, N. C.
2527	Star	J. Weller & Co., Cincinnati, O.	Sergeant-Clayton Co., Roxboro, N. C.
2634	Catsup Heinz	H. J. Heinz Co., Pittsburg, Pa.	A. T. Bush, Edenton, N. C.
2640	Banquet	C. A. Helwig Bros. & Tuer, Baltimore, Md.	A. B. Seeley & Son, Elizabeth City, N. C.
2643	Blue Label	Curtice Bros. Co., Rochester, N. Y.	J. G. Faring & Co., Elizabeth City, N. C.
2644	Beefsteak	Jos. Campbell Preserve Co., Camden, N. J.	do
2645	Tabasco	do	do
2723	Blue Ribbon	Hyman Pickle Co., Louisville, Ky.	——, Asheville, N. C.
2724	Van Camp	Van Camp Packing Co., Indianapolis, Ind.	do
2725	Standard Homemade.	American Preserve Co., Philadelphia, Pa.	do
2726	Premier	F. H. Leggett & Co., New York.	do
2727	Admiral	Knadler & Lucas, Louisville, Ky.	do
2728	Schimmel Homemade.	American Preserve Co., Philadelphia, Pa.	do
2729	Olympia	J. Weller & Co., Cincinnati, O.	do
2771	Yankee Doodle	American Relish Co., Indianapolis, Ind.	——, Wadesboro, N. C.
2889	Old Home Ideal	Burnett, Sloan & Co., New York.	W. G. Lowry, Rockingham, N. C.
2890	Wilson	Wilson Catsup Co., Baltimore, Md.	H. H. Smith, Rockingham, N. C.
3014	Campbell's Tomato	Campbell Preserve Co., Camden, New Jersey.	
2057	Blue Label	Curtice Bros. Co., Rochester, N. Y.	E. B. Hackburn, New Bern, N. C.
2058	Walnut	Cross & Blackwell, London	do

*Coal-tar dye.

TION OF TOMATO CATSUP.

Laboratory Number.	Retail Price of Bottle—cents.	Price per Pint—cents.	Quantity in Bottle—pints.	Total Solids—per cent.	Acidity, as Acetic Acid—per cent.	Preservatives.	Coloring Matter.
2018	15	30	0.48	18.14	1.36	Benzoic acid—large amount	Eosine.*
2019	20	33	0.58	20.47	1.57	Benzoic acid	Eosine.*
2020	35	44	0.80	23.31	1.75	----do	Eosine.*
2021	10	12½	0.82	12.97	.92	Benzoic acid—small amount	Eosine.*
2022	10	11	0.89	10.66	1.21	Benzoic acid	Coal-tar dye.
2024	25	25	1.01	21.22	1.55	----do	Eosine.*
2060	30	30	1.04	20.98	1.95	Salicylic acid	Eosine.*
2066	5	10	0.05	18.20	.81	Benzoic acid	Eosine.*
2059	25	25	0.96	17.84	.93	Benzoic acid—large amount	Eosine.*
2067	10	11	0.87	13.84	1.65	Benzoic acid	Eosine.*
2511	25	25	1.05	17.16	1.21	Benzoic acid—large amount	Eosine.*
2519	15	30	0.53	16.89	.85	----do	Eosine.*
2522	30	27	1.07	20.39	1.21	Benzoic acid	Eosine.*
2524	10	12½	0.78	11.85	.87	----do	Eosine.*
2527	15	16½	0.89	21.62	1.09	Salicylic acid	Eosine.*
2634	25	42	0.55	15.24	1.26	Benzoic acid	Eosine.*
2640	10	10	1.00	12.48	.92	Benzoic acid—large amount	Ponceau.*
2643	25	25	0.96	16.91	.92	----do	Eosine.*
2644	25	25	0.98	16.42	1.31	----do	Eosine.*
2645	10	16½	0.59	18.74	1.60	----do	Eosine.*
2723	----	----	0.89	11.53	1.39	----do	Eosine.*
2724	----	----	0.51	12.50	1.26	----do	Eosine.*
2725	----	----	0.71	17.18	.95	----do	Ponceau.*
2726	----	----	1.03	23.49	1.55	----do	Eosine.*
2727	----	----	0.82	10.56	1.51	Benzoic acid—small amount	Eosine.*
2728	----	----	0.87	16.72	1.31	Benzoic acid—large amount	Ponceau.*
2729	----	----	0.80	29.35	1.31	----do	Eosine.*
2771	----	----	0.85	12.97	1.41	Benzoic acid	Eosine.*
2889	15	16½	0.88	13.81	1.31	Benzoic acid—very large amount	Eosine.*
2890	10	20	0.47	16.65	.61	Benzoic acid	Eosine.*
3014	----	----	0.55	18.51	1.50	Benzoic acid—very large amount	Eosine.*
2057	25	56	0.44	15.98	.58	Salicylic acid (about 50 grs. per gal.).	Eosine.*
2058	30	75	0.42	19.35	3.79	Benzoic acid	Eosine.*

RESULTS OF EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2061	Chili	Heinz & Co., Pittsburg, Pa.	E. B. Hackburn, New Bern, N. C.
2064	Worcester	do	do
2065	Worcestershire	Lea & Perrins, Worcester, England.	do
2512	Chili Heinz	H. J. Heinz & Co., Pittsburg, Pa.	W. I. Everett, Rockingham, N. C.
2515	Worcester Heinz	do	do
2523	Worcestershire	Price & Lucas Cider and Vinegar Co., Louisville, Ky.	Rose & Wilson, Winston, N. C.
2525	Worcestershire	Lea & Perrins, New York	W. P. Ware, Reidsville, N. C.
2526	Worcester	Jos. Campbell Preserve Co., Camden, N. J.	do
2635	Worcestershire	Lea & Perrins, New York	A. T. Bush, Edenton, N. C.
2636	Worcester	Van Lill Preserving Co., Baltimore, Md.	do
2528	do	do	Sergeant-Clayton Co., Roxboro, N. C.
2637	Longfields	J. Longfield, New York	A. T. Bush, Edenton, N. C.
2639	Worcester	H. J. Heinz Co., Pittsburg	A. B. Seeley & Son, Elizabeth City.
2730	do	Hirsch Preserving Co., Pittsburg.	——, Asheville, N. C.
2731	do	J. Weller & Co., Cincinnati	do
2885	Worcestershire	Crown Sauce Co., London	J. A. Newberry, Rockingham, N. C.

*Coal-tar dye.

NATION OF SAUCES.

Laboratory Number.	Retail Price of Bottle—cents.	Price per Pint—cents.	Quantity in Bottle—pints.	Total Solids—per cent.	Acidity, as Acetic Acid—per cent.	Preservatives.	Coloring Matter.
2061	30	43	0.72	25.13	1.80	Benzoic acid—small amount	Eosine.*
2064	25	50	0.53	27.74	3.31	----do	Eosine.*
2065	50	1.25	0.39	20.23	2.92	Salicylic acid—large amount	Tropeolin.*
2512	.25	33½	0.74	27.46	2.33	Benzoic acid	Eosine *
2515	20	40	0.51	21.70	3.21	----do	Tropeolin.*
2523	15	32	0.47	16.63	3.30	----do	Tropeolin.*
2525	30	75	0.38	20.77	3.31	Salicylic acid—very large amount	Tropeolin.*
2526	.15	----	----	11.73	1.77	Benzoic acid	Eosine.*
2635	25	62½	0.39	23.24	3.33	Salicylic acid	Tropeolin.*
2636	15	37½	0.38	24.74	4.28	Salicylic acid—very large amount	Tropeolin.*
2528	15	37	0.39	14.94	2.53	Salicylic acid	Tropeolin.*
2637	15	37½	0.38	18.47	3.03	Benzoic acid	Tropeolin.*
2639	20	44	0.44	19.06	3.31	----do	Tropeolin.*
2730	----	----	0.39	9.51	3.60	----do	Tropeolin.*
2731	----	----	0.42	26.90	3.31	----do	Tropeolin.*
2885	15	40	0.37	10.67	3.21	----do	Tropeolin.*

SUGAR, MOLASSES, MAPLE SYRUP AND HONEY.

By J. M. Pickel.

I. SUGAR.

Sugar is defined as the product chemically known as sucrose (saccharose), chiefly obtained from sugar cane, sugar beets, sorghum, maple or palm.

No adulteration was found. Twenty-nine samples of white sugar, collected in sixteen different towns of the State, were examined; all were found to be of high quality. These sugars retailed at 6, 6¼, 6½, 7 and 10 cents a pound. There is no reason to suppose that the higher-priced sugars are superior in sweetening power or food value to the cheaper ones, but those selling at 10 cents were either pulverized or branded "*Cut Loaf*," "Standard Granulated."

Likewise the brown sugars, of which sixteen samples were tested, were found to be unsophisticated. They contained 83 to 95 per cent of sucrose as against 99.5 to 100 per cent in the white sugars. This difference is due mainly to moisture and small quantity of molasses. The brown sugars retailed at 5, 5½, 5¾ and 6 cents a pound.

II. MOLASSES.

Molasses is understood to be a product derived wholly from sugar cane or sorghum.

Glucose is the chief adulterant of molasses. Two years ago only one out of the fourteen samples examined and claiming to be molasses was found to be free from glucose; this year eight out of the eleven samples examined contained no glucose. This would seem to indicate that glucose mixture is coming to be less frequently passed off as molasses; but it does not mean that less glucose mixture is being sold. On the contrary, the manufacture and use of glucose, commonly mixed with molasses, has assumed large proportions and is on the increase. But this product is being more and more sold on its own merits as corn syrup, compound syrup, etc. Glucose, when properly made from corn starch, is a wholesome food. Modern methods of sugar refining, whilst they have greatly increased the output of sugar and raised its quality, have had the opposite effect on molasses.

The old-time high-grade open-kettle plantation molasses is a rarity. This fact leads to its adulteration. Two cases of gross deception of this kind were discovered this year, namely, samples Nos. 2670 and 2671. Each of these samples is nicely put up in tins and is of superior appearance. The first-named claims to be "Ye Olden-times Sugar-house Molasses." The other (No. 2671) bears this guarantee:

"To the Consumer: *The purchaser of this can of molasses may rest assured that he has the very best article of* Open-kettle Molasses *produced upon the plantations of Louisiana.*"

Yet both these samples are glucose mixtures. Sample No. 2671, oddly enough, despite its high claims, sold for 15 cents a quart, or 25 per cent less than the majority of the genuine molasses.

III. MAPLE SUGAR.

The sugar of the maple-sugar tree is identical with that of sugar cane, the peculiar maple flavor being due to substances other than sugar. Adulteration of maple sugar or syrup with cane sugar is not easy, if at all, to be detected. The samples examined appear to be genuine; they contained no glucose.

IV. HONEY.

Glucose is the most common adulterant of honey. Sucrose and invert sugar* are also used for this purpose. It is not always easy to distinguish a genuine honey from one to which invert sugar has been added. Samples Nos. 2567 and 2074 seem to contain artificially-added invert sugar,* or to have been made by bees that had been fed on invert sugar. Samples Nos. 2566 and 2072 are probably genuine. Samples Nos. 2568 and 2071 are glucose mixtures and were sold as such, but they are good illustrations of a much-practiced method of deception, namely, the label of each bears the word "honey" in large and very conspicuous type, and in small, inconspicuous type a formula claiming two parts of grape sugar and one part honey. The grape sugar is, of course, glucose.

Regarding the adulteration of comb honey, the Chief Chemist of the United States Department of Agriculture says (Bulletin 13, year 1892): "Many samples of comb honey containing only glucose have come under my observation, but in all these cases the comb, presumably after separation of the honey by a centrifugal machine, had been placed in glass bottles and the glucose then added. I have never yet found a sample of comb honey, sold in the frame, which was artificial, except in the use of comb foundation." It was to this practice that reference was had in the statement in a former Bulletin. "'Honey in the comb' is frequently glucose which has acquired a more or less honey odor and flavor by being poured into the comb from which the genuine article has been drained"; and no reference was had to honey comb sold in frames.

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*Invert sugar is made by heating a solution of sucrose with dilute acids. It consists of equal parts of dextrose and levulose. Dextrose and levulose occur naturally in fruits and in honey.

RESULTS OF EXAMI

WHITE

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2289	Granulated	Franklin Refining Co., New York, N. Y.	McKee, Son & Co , Littleton, N. C.
2033	do	B. H. Howell, Son & Co., New York, N. Y.	Cannon-Fetzer Co., Concord, N. C.
2310	do	Mollenhauer Sugar Refining Co., Brooklyn, N. Y.	S. J. Stallings, Littleton, N. C.
2304	Eagle Granulated	Havemeyer & Elder Sugar Refinery, New York, N. Y.	Davis, Watkins & Co., Henderson, N. C.
2302	Granulated	do	R. B. Powell, Henderson, N. C.
2308	do		J. W. Worthington, Littleton, N. C.
2301	do	Arbuckle Bros., New York, N. Y.	J. S. Brown, Oxford, N. C.
2311	do	John A. Gills & Bro. (Brokers), Petersburg, Va.	J. F. Newsom, Littleton, N. C.
2029	Cut Loaf		W. D. LaRoque, Jr., Kinston, N. C.
2027	Standard Granulated.	Arbuckle Bros., New York, N. Y.	do
2298	Granulated	Mollenhauer Sugar Refining Co., Brooklyn, N. Y.	Sergeant-Clayton Co., Roxboro, N. C.
2028	Pulverized		W. D. LaRoque, Jr., Kinston, N. C.
2031	Granulated	C. W. Antrim & Son, Richmond, Va.	J. M. Morris & Son, Thomasville, N. C.
2306	do	Havemeyer & Elder Sugar Refinery, New York, N. Y.	Parham Bros. Supply Co., Henderson, N. C.
2034	Pulverized	Austin Nichols & Co., New York, N. Y.	P. H. Johnson, High Point, N. C.
2309	Granulated	Franklin Refining Co., New York, N. Y.	J. H. Harrison & Co., Littleton, N. C.
2296	do	Haven Sugar Refining Co., Philadelphia, Pa.	W. P. Ware, Reidsville, N. C.
2307	do	E. A. Saunders & Son, Richmond, Va.	Eugene Johnson, Littleton, N. C.
2299	do	Mollenhauer Sugar Refining Co., Brooklyn, N. Y.	A. R. Foushee & Son, Roxboro, N. C.
2030	do	C. W. Antrim & Son, Richmond, Va.	P. H. Johnson, High Point, N. C.
2293	Coarse Granulated	Austin Nichols & Co., New York, N. Y.	J. L. Clement, Mocksville, N. C.
2954	Granulated		W. G. Lowry, Rockingham, N. C.
2025	do	B. H. Howell & Son Co., New York, N. Y.	E. B. Hackburn, New Bern, N. C.
2715	do	Mollenhauer Refining Co., Philadelphia, Pa.	A. B. Seeley & Son, Elizabeth City, N. C.
2713	do	Havemeyer & Elder Sugar Refinery, New York, N. Y.	A. T. Bush, Edenton, N. C.
2956	do	L. C. Younger, Richmond, Va.	J. R. Smith, Rockingham, N. C.
2714	Pulverized	Havemeyer & Elder Sugar Refinery, New York, N. Y.	A. T. Bush, Edenton, N. C.
2035	Red	Austin Nichols & Co., New York, N. Y.	P. H. Johnson, High Point, N. C.
2032	Granulated	Lexington Grocery Co., Lexington, N. C.	W. H. Moffitt, Lexington, N. C.

NATION OF SUGARS.

SUGARS.

Laboratory Number.	Price.	Polarization.	
		Temperature.	Direct.
2289	7 cents per pound	22 degrees	99.7 per cent sucrose.
2033	6¼ cents per pound	do	99.6 do.
2310	6 cents per pound	do	99.7 do.
2304	do	do	99.7 do.
2302	do	do	99.6 do.
2308	do	do	99.7 do.
2301	do	do	99.7 do
2311	do	do	99.8 do.
2029	10 cents per pound	do	99.7 do.
2027	do	do	99.8 do.
2298	6 cents per pound	do	99.9 do.
2028	10 cents per pound	do	99.7 do.
2031	6 cents per pound	do	99.5 do.
2306	do	do	99.7 do.
2034	10 cents per pound	do	99.6 do.
2309	6 cents per pound	do	100.0 do.
2296	do	do	99.7 do.
2307	do	do	100.0 do.
2299	do	do	99.5 do.
2030	do	23 degrees	99.8 do.
2293	6½ cents per pound	do	99.7 do.
2954	6 cents per pound	do	99.9 do.
2025	do	do	99.9 do.
2715		do	100.0 do.
2713		do	100.0 do.
2956	do	do	99.9 do.
2714	do	do	99.8 do.
2035	20 cents per pound	do	99.2 do.
2032	6 cents per pound	do	99.8 do.

RESULTS OF THE EXAMINA

BROWN

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2038	Brown	B. H. Howell, Son & Co., New York.	Cannon-Fetzer Co., Concord; N. C.
2037	---do	Lexington Grocery Co., Lexington, N. C.	W. H. Moffitt, Lexington, N. C.
2026	Excelsior	B. H. Howell, Son & Co., New York.	E. B. Hackburn, New Bern, N. C.
2292	Yellow Extra C	Austin Nichols & Co., New York.	J. L. Clement, Mocksville, N. C.
2305	Brown	Antrim & Son, Richmond, Va.	Davis, Watkins & Co., Henderson, N. C.
2291	---do	----------	J. S. Smyre, Newton, N. C.
2294	---do	E. R. Messic, Winston, N. C.	Nash & McGehee, Winston, N. C.
2036	---do	C. W. Antrim & Son, Richmond, Va.	J. M. Morris & Son, Thomasville, N. C.
2300	---do	---do	J. S. Brown, Oxford, N. C.
2290	---do	Franklin Refinery Co., New York.	McGhee, Son & Co., Lincolnton, N. C.
2297	---do	R. W. Lawson, South Boston, Va.	Sergeant-Clayton Co., Roxboro, N. C.
2295	---do	Haven's Sugar Refining Co., Philadelphia, Pa.	W. P. Moore, Reidsville, N. C.
2303	---do	----------	R. B. Powell, Henderson, N. C.
2955	Brown BB	J. G. Taylor, Wilmington, N. C.	W. G. Lowrie, Rockingham, N. C.
2957	Brown	----------	J. R. Smith, Rockingham, N. C.
2712	---do	Havemeyer & Elder, New York.	A. T. Bush, Edenton, N. C.

TION OF SUGARS—CONTINUED.

SUGARS.

Laboratory Number.	Price.	Polarization.			Sucrose.
		Temperature.	Direct.	After Inversion.	
2038	5¾ cents per pound	25 degrees	88.0	—27.8	88.9 per cent.
2037	5 cents per pound	do	86.4	—27.4	87.2 do.
2026	do	20 degrees	94.4	—30.8	94.1 do.
2292	5½ cents per pound	22 degrees	95.8	—29.2	94.7 do.
2305	6 cents per pound	25 degrees	85.0	—27.0	85.4 do.
2291	5½ cents per pound	21 degrees	83.8	—29.2	85.3 do.
2294	do	22 degrees	83.2	—27.6	83.9 do.
2036	5 cents per pound	21 degrees	87.0	—30.0	88.3 do.
2300	6 cents per pound	20 degrees	82.6	—29.0	83.9 do.
2290	do	do	87.6	—29.6	87.9 do.
2297	5 cents per pound	do	84.2	—29.8	85.7 do.
2295	do	21 degrees	82.8	—29.2	84.5 do.
2303	6 cents per pound	25 degrees	84.0	—26.4	84.5 do.
2955	5 cents per pound	do	84.32	—27.8	85.8 do.
2957	do	do	87.4	—27.6	88.1 do.
2712		22 degrees	81.6	—27.6	82.7 do.

RESULTS OF THE EXAM

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2542	Porto Rico	Austin Nichols & Co., New York, N. Y.	J. F. Smyre, Newton, N. C.
2543	---do---	---do---	W. P. Ware, Reidsville, N. C.
2544	---do---	---do---	A. R. Foushee, Roxboro, N. C.
2545	Santa Rosa	C. W. Antrim & Son (Jobbers), Richmond, Va.	J. S. Brown, Oxford, N. C.
2546	Porto Rico, No. 9	E. A. Saunders (Jobber), Richmond, Va.	Parham Bros. Supply Co., Henderson, N. C.
2547	Porto Rico	Roper & Co. (Jobbers), Petersburg, Va.	J. R. Powers & Co., Littleton, N. C.
2548	Porto Rico	Christian & Winfree (Jobbers), Richmond, Va.	J. H. Harrison & Co., Littleton, N. C.
2549	New Orleans	Planters Syrup Refining Co., Atlanta, Ga.	J. L. Stallings, Littleton, N. C.
2669	New Orleans	New York Molasses Co., New York.	Toxey & Gallup, Elizabeth City, N. C.
2670	Dove	W. H. Alexander & Co., New Orleans, La.	J. G. Fearing & Co., Elizabeth City, N. C.
2671	Old Fashion Open-kettle Plantation Molasses.	Pinick & Ford, Shreveport, La.	J. G. Fearing & Co., Elizabeth City, N. C.

a Diluted to one-fourth normal strength and the reading multiplied by four.
b Diluted to one-eighth normal strength and the reading multiplied by eight.
c Diluted to one-sixteenth normal strength and the reading multiplied by sixteen.

RESULTS OF THE EXAM

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2551	Green Mountain Maple Syrup.	Austin Nichols & Co., New York, N. Y.	Bruner & Huey, Monroe, N. C.
2076	Maple Syrup	Crystal Conserve Co., New York, N. Y.	Cannon-Fetzer Co., Concord, N. C.
2183	---do---	---do---	J. W. Harris & Co., High Point, N. C.
2056	Maple Sugar Cream	Welch Bros. Maple Co., Burlington, Vt.	E. B. Hackburn, New Bern, N. C.

RESULTS OF THE EXAM

2566	"Moon" Honey	F. H. Leggett & Co., New York, N. Y.	McKee, Son & Co., Lincolnton, N. C.
2567	Premier Honey	---do---	R. S. Abernathy, Lincolnton, N. C.
2568	Hio Valley Extra Fancy Honey.	Hio Valley Preserving Co., Baltimore, Md.	Hugh Woods, Roxboro, N. C.
2071	Extra Fancy Honey	Perfection Jar Closure Co., Philadelphia, Pa.	E. B. Hackburn, New Bern, N. C.
2072	"Moon" Honey	F. H. Leggett & Co., New York, N. Y.	---do---
2074	Premier Honey	---do---	Cannon-Fetzer Co., Concord, N. C.

INATION OF MOLASSES.

Laboratory Number.	Price per Pint—cents.	Polarization.				Per cent of Sucrose.	Remarks.
		Temperature.	Direct.	After Inversion.	After Inversion at 86–88 Degrees.		
2542	10	23°	38.4	—10.2	5.6*b*	36.9	Not found adulterated.
2543	10	22°	32.2	—12.8*b*	—5.6*b*	34.0	do.
2544	10	22°	30.2	—11.2*b*	0.0	31.4	do.
2545	10	23°	34.8	—8.8*a*	4.8*b*	33.1	do.
2546	10	23°	60.0	32.0*a*	32.8*b*	21.3	Adulterated with glucose.
2547	10	23°	29.0	—8.0*b*	0.8*b*	28.1	Not found adulterated.
2548	10	21°	27.2*a*	4.0*b*	—4.8*c*	.....	do.
2549	6	23°	32.8*a*	—12.0*b*	3.2*c*	34.0	do.
2669	5	23°	28.1	—13.6	8.0	31.7	do.
2670	10	19°	118.8	98.6	92.0	15.1	Adulterated with glucose.
2671	7½	23°	71.0	23.6	33.0	36.0	do.

INATION OF MAPLE SYRUP.

Laboratory Number.	Price.	Polarization.				Per cent. of Sucrose.	Remarks.
		Temperature.	Direct.	After Inversion.	After Inversion at 86–88 Degrees.		
2551	22½ cents per pint.	22°	56.2	—18.6	0.3	56.6	Not found adulterated.
2076	17½ cents per pint.	20°	60.4	—19.4	0.0	60.4	do.
2183	----do-----	20°	50.0	—20.8	1.0	53.6	do.
2056	25 cents per can.	20°	41.6	—13.0	0.3	41.3	do.

INATION OF HONEY.

2566	20 cents per pint.	22°	—11.4	—15.8	.....	.....	Probably genuine.
2567	25 cents per pint.	20°	—16.2	—21.0	.....	.....	Probably contains invert sugar.
2568	12 cents per jar.	20°	141.8	127.6	.....	.....	Mixed with glucose.
2071	20 cents per pint.	20°	99.8	96.4	.....	.....	do.
2072	20 cents per 1½ pints.	20°	—13.0	—19.6	.....	.....	Probably genuine.
2074	20 cents per pint.	20°	—18.0	—22.0	.....	.....	Probably contains invert sugar.

FLOUR.

By C. D. Harris and F. C. Lamb.

Flour is a very fine white product made from the wheat grain.

There are three grades of flour, namely: High grade, low grade and dark feeding flour.

The *High Grade Flours* are the pure white and highest in price, though not in all cases the most nutritious.

Low Grade Flour is darker in color than the high grade, but the nutrients in low grade flour vary little from those in high grade.

Dark Feeding Flour.—The lowest grade of flour, known as dark feeding flour, "Red-dog," etc., usually contains the germs of the wheat grain, and because of this it is rich in protein and fat.

Such flour has a high food value.

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1747	Daisy	Lambeth Bros., Thomasville, N. C.	D. I. Brooks, Thomasville, N. C.
1748	Pond Lily	Wachovia Mills, Winston, N. C.	N. D. Sullivan, Walkertown, N. C.
1754		Lambeth Bros., Thomasville, N. C.	
1780			M. G. Farmer, Friezeland, N. C.
1816	White Rose	(Oriental Mills) F. Thomas & Bros., Lansing, Mich.	J. A. Edwards, Sr., Hookerton, N. C.
1888			C. L. Boddie, Nashville, N. C.
1889	Golden Eagle	Staunton Milling Co., Staunton, Ill.	Aydlett Bros., Elizabeth City, N. C.
1902			T. M. C. Davidson, Statesville, N. C.
1905			R. J. Frederick, Guilford College, N. C.
1915		Pearl Roller Mills, Randleman, N. C.	Tucker & Erwin, Greensboro, N. C.
1917	Bakers' Choice	Guilford Roller Mills, Greensboro, N. C.	Guilford Roller Mills, Greensboro, N. C.
1918	Our Best Patent	do	do
1919	Star	Greensboro Roller Mills, Greensboro, N. C.	Greensboro Roller Mills, Greensboro, N. C.
1920	Purity Best Patent	do	do
1921	Our Patent	Model Mills, Lexington, N. C.	Model Mills, Lexington, N. C.
1922	Monarch Straight	do	do
1924	Queen of the South	Lexington Roller Mills, Lexington, N. C.	Lexington Roller Mills, Lexington, N. C.
1925	Grimes' Best	do	do
1926	XXX Patent	North Side Roller Mill, Salisbury, N. C.	North Side Roller Mill, Salisbury, N. C.
1927	Gilt Edge	do	do

Flour is sometimes adulterated with some product of corn or finely-ground mineral substances.

The microscope is used to detect these adulterants. The starch grains of wheat and corn vary considerably in shape, size and kind of hilum, besides a difference of behavior when subjected to polarized light.

The mineral substances added appear under the microscope as definite crystals, varying in shape, size and length, according to the substance or substances added.

A high per cent of ash indicates the addition of some foreign mineral substance.

RESULTS OF THE EXAMINATION OF FLOUR.

Seventy-seven samples of flour were examined and all were found to be pure wheat products. The results follow in the tables.

NATION OF FLOUR.

Laboratory Number.	Date of Purchase.	Retail Price.	Ash.	Microscopic Examination Showed Sample to be—
1747		$ 4.00 per barrel		Pure wheat flour.
1748				do.
1754				do.
1780				do.
1816	April 3, 1903	4.75 per barrel		do.
1888	June 18, 1903			do.
1889	June 26, 1903	3.50 per barrel		do.
1902			.41 per cent.	do.
1905	July 27, 1903			do.
1915	July 29, 1903		.31 per cent.	do.
1917	do	4.30 per barrel	.48 per cent.	do.
1918	do	4.60 per barrel	.43 per cent.	do.
1919	do	4.30 per barrel	.54 per cent.	do.
1920	do	4.60 per barrel	.45 per cent.	do.
1921	July 31, 1903	4.00 per barrel	.75 per cent.	do.
1922	do	4.40 per barrel		do.
1924	do	4.20 per barrel	.43 per cent.	do.
1925	do	4.50 per barrel	.43 per cent.	do.
1926	do	do	.40 per cent	do.
1927	do	4.30 per barrel	.44 per cent.	do.

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1928	----------	Salisbury Roller Mill, Salisbury, N. C.	Salisbury Roller Mill, Salisbury, N. C.
1929	First Patent	do	do
1930	----------	Fenix Flour Mill, Concord, N. C.	Fenix Flour Mill, Concord, N. C.
1932	Straight Family	Cabarrus Roller Mills, Concord, N. C.	Cabarrus Roller Mills, Concord, N. C.
2000	Luxury	High Point Milling Co., High Point, N. C.	High Point Milling Co., High Point, N. C.
2001	White Frost	do	do
2002	N. C. Patent	Thomasville Roller Mills, Thomasville, N. C.	Thomasville Roller Mills, Thomasville, N. C.
2004	Straight	do	do
2185	I. X. L.	John Strong & Son, South Rockwood, Mich.	E. B. Hackburn, New Bern, N. C.
2186	Peerless	do	do
2187	Obelisk	Ballard & Ballard Co., Louisville, Ky.	C. E. Siceloff, High Point, N. C.
2188	Tar Heel	Grimes Bros., Lexington, N. C.	N. H. Moffitt, Lexington, N. C.
2312	Tar Heel	T. J. Ramseur & Son, Lincolnton, N. C.	McKee, Son & Co., Lincolnton, N. C.
2313	Nellie King	Tennessee Milling Co., Estill, Tenn.	Best & Newton, Hickory, N. C.
2314	Eagle	Farmers Milling Co., Conover, N. C.	do
2315	Belle of Newton	Newton Roller Mills, Newton, N. C.	J. S. Smyre, Newton, N. C.
2316	Ice Cream	Horn Bros. & Johnson, Mocksville, N. C.	C. E. Landford, Mocksville, N. C.
2317	Winston Queen	Forsyth Roller Mills, Winston, N. C.	Nash & McGehee, Winston, N. C.
2318	Rising Sun	do	Rose & Wilson, Winston, N. C.
2319	Piedmont	S. C. Hurt & Son, Lynchburg, Va.	W. P. Ware, Reidsville, N. C.
2320	Sea Foam	Warner Moore & Co., Richmond, Va.	do
2321	Farmers' Choice	J. H. Walker & Co., Reidsville, N. C.	do
2322	Imperial	Isaac Horter Co., Toledo, Ohio	Sergeant-Clayton Co., Roxboro, N. C.
2323	Piedmont	S. C. Hurt & Son, Lynchburg, Va.	do
2324	Cream of Wheat	Page Milling Co., Luray, Va.	Hugh Woods, Roxboro, N. C.
2325	Royal Crown	Stuart Draft Milling Co., Stuart Draft, Va.	A. R. Foushee, Roxboro, N. C.
2326	White Lily	Rockbridge Roller Mills, East Lexington, Va.	do
2327	Challenge	Isaac Horter Co., Toledo, Ohio	do
2328	Obelisk	Ballard & Ballard Co., Louisville, Ky.	J. S. Brown, Oxford, N. C.
2329	Waterloo	do	do
2330	Electric Patent	Bridgewater Roller Mills, Bridgewater, Va.	do
2331	Crystal Patent	H. Bland & Co. (Brokers), Richmond, Va.	C. A. Carroll, Oxford, N. C.
2332	Pride of Virginia	Harrisonburg Roller Mills, Harrisonburg, Va.	do
2333	Virginia Daisy	Berryville Milling Co., Berryville, Va.	do
2334	Obelisk	Ballard & Ballard Co., Louisville, Ky.	R. B. Powell, Henderson, N. C.
2335	Dan Valley	Dan Valley Mills, Danville, Va.	Davis-Watkins Co., Henderson, N. C.
2336	Oak Ridge	do	do

NATION OF FLOUR—CONTINUED.

Laboratory Number.	Date of Purchase.	Retail Price.	Ash.	Microscopic Examination Showed Sample to be—
1928	July 31, 1903	$ 4.20 per barrel	.32 per cent	Pure wheat flour.
1929	do	4.60 per barrel	.30 per cent	do.
1930	August 1, 1903	4.25 per barrel	.50 per cent	do.
1932	do	do	.42 per cent	do.
2000	July 20, 1903	4.10 per barrel	.44 per cent	do.
2001	do	4.60 per barrel	.40 per cent	do.
2002	do	4.40 per barrel	.44 per cent	do.
2004	July 30, 1903	4.20 per barrel	.41 per cent	do.
2185	July 15, 1903		.36 per cent	do.
2186	do	4.90 per barrel	.49 per cent	do.
2187	July 30, 1903	5.60 per barrel	.39 per cent	do.
2188	July 31, 1903	3.92 per barrel	.49 per cent	do.
2312	July 28, 1903	5.88 per barrel	.39 per cent	do.
2313	July 29, 1903	do	.43 per cent	do.
2314	do	do	.44 per cent	do.
2315	July 30, 1903	4.90 per barrel	.44 per cent	do.
2316	August 1, 1903	do	.48 per cent	do.
2317	August 3, 1903	6.86 per barrel	.33 per cent	do.
2318	do	5.88 per barrel	.41 per cent	do.
2319	August 5, 1903	do	.39 per cent	do.
2320	do	do	.35 per cent	do.
2321	do	do	.47 per cent	do.
2322	August 8, 1903	do	.66 per cent	do.
2323	do	do	.37 per cent	do.
2324	do	do	.42 per cent	do.
2325	do	do	.45 per cent	do.
2326	do	do	.38 per cent	do.
2327	do	do	.72 per cent	do.
2328	August 10, 1903	do	.40 per cent	do.
2329	do	do	.74 per cent	do.
2330	do	do	.44 per cent	do.
2331	do	do	.40 per cent	do.
2332	do	do	.52 per cent	do.
2333	do	do	.48 per cent	do.
2334	August 11, 1903	do	.39 per cent	do.
2335	do	do	.38 per cent.	do.
2336	do	do	.50 per cent	do.

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2337	Henry Clay	Lexington Roller Mills Co., Lexington, Ky.	Davis-Watkins Co., Henderson, N. C.
2338	Standard	Steven City Milling Co., Steven City, Va.	Parham Bros. Supply Co., Henderson, N. C.
2339	Obelisk	Ballard & Ballard Co., Louisville, Ky.	C. Johnson, Littleton, N. C.
2340	Honest	J. T. Triplett, Mount Jackson, Ky.	do
2341	Royal Straight	Key & Furr, East Lexington, Va.	J. R. Powers, Littleton, N. C.
2342	White Star	Roper & Co. (Brokers), Petersburg, Va.	do
2343	Gold Dust	Strasburg Flour Mills, Strasburg, Va.	J. W. Northington, Littleton, N. C.
2344	Obelisk	Ballard & Ballard Co., Louisville, Ky.	do
2345	Majestic	Liberty Mills, Nashville, Tenn.	J. H. Harrison & Co., Littleton, N. C.
2346	Piedmont	S. C. Hurt & Son, Lynchburg, Va.	S. J. Stallings, Littleton, N. C.
2347	Tuberose	M. L. T. Davis & Co. (Brokers), Norfolk, Va.	N. H. Shearin, Littleton, N. C.
2348	White Swan	Stuart Draft Milling Co., Stuart Draft, Va.	J. F. Newsom, Littleton, N. C.
2349	Best Patent	do	do
2709	Dunlop's Superlative.	Dunlop Mills, Richmond, Va.	A. T. Bush, Edenton, N. C.
2710		F. W. Stock, Sheffield, Mich	do
2711		Smith Milling Co., Circleville, Ohio.	A. B. Seeley & Son, Elizabeth City, N. C.
2950	Baldwin's Choice	Gamble Milling Co., Baltimore, Md.	J. M. Smith, Rockingham, N. C.
2951	White Rose	Harrisonburg Milling Co., Harrisonburg, Va.	do
2952			W. G. Lowry, Rockingham, N. C.
2953	Matchless	Virginia Bolting Mills	do

NATION OF FLOUR—CONTINUED.

Laboratory Number.	Date of Purchase.	Retail Price.	Ash.	Microscopic Examination Showed Sample to be—
2337	August 11, 1903	$ 5.88 per barrel	.39 per cent.	Pure wheat flour.
2338	do	do	.46 per cent.	do.
2339	August 12, 1903	do	.43 per cent.	do.
2340	do	do	.45 per cent.	do.
2341	do	4.90 per barrel	.48 per cent.	do.
2342	do	do	.55 per cent.	do.
2343	do	5.88 per barrel	.54 per cent.	do.
2344	do	do	.33 per cent.	do.
2345	do	do	.35 per cent.	do.
2346	do	do	.37 per cent.	do.
2347	do	do	.54 per cent.	do.
2348	do	do	.49 per cent.	do.
2349	do	do	.45 per cent.	do.
2709	August 4, 1903	5.00 per barrel	.41 per cent.	do.
2710	do	4.50 per barrel	.55 per cent	do.
2711	August 14, 1903	4.60 per barrel	.42 per cent.	do.
2950	August 31, 1903	4.10 per barrel	.74 per cent.	do.
2951	do	4.30 per barrel	.56 per cent.	do.
2952	do	5.00 per barrel	.42 per cent.	do.
2953	do	do	.47 per cent.	do.

CORN MEAL.

By C. D. Harris and F. C. Lamb.

Considering the nutrition it carries and the market price, corn is by far the cheapest food offered to man over a large part of the civilized world.

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1916		Guilford Roller Mills, Greensboro, N. C.	Guilford Roller Mills, Greensboro, N. C.
1923		Lexington Roller Mills, Lexington, N. C.	Lexington Roller Mills, Lexington, N. C.
1931		Cabarrus Roller Mills, Concord, N. C.	Cabarrus Roller Mills, Concord, N. C.
2005	Water Ground	W. T. Horn & Co., Norfolk, Va.	Burrus & Gray Co., New Bern, N. C.
2007		Elizabeth City Milling Co., Elizabeth City, N. C.	C. L. Spencer, New Bern, N. C.
2008		Neuse Milling Co., Kinston, N. C.	
2009		Dunlop Mills, Richmond, Va.	J. W. Isler & Co., Goldsboro, N. C.
2010		Greensboro Roller Mills, Greensboro, N. C.	
2011		High Point Milling Co., High Point, N. C.	
2012		Thomasville Roller Mill, Thomasville, N. C.	
2350		Lincoln Milling Co., Lincolnton, N. C.	McKee, Son & Co., Lincolnton, N. C.
2351		Newton Roller Mill, Newton, N. C.	J. F. Smyre, Newton, N. C.
2352		J. A. Mickey, Winston, N. C.	Nash & McGehee, Winston, N. C.
2353		J. H. Walker, Reidsville, N. C.	W. P. Ware, Reidsville, N. C.
2354		S. C. Hurt & Son, Lynchburg, Va.	Sergeant-Clayton Co., Roxboro, N. C.
2355		Eugene Falkner, Henderson, N. C.	R. B. Powell, Henderson, N. C.
2356		do	Davis-Watkins Co., Henderson, N. C.
2357		O. O. Young, Henderson, N. C.	do
2358		J. W. Pool & Son (Brokers), Petersburg, Va.	J. H. Harrison & Co., Littleton, N. C.
2359		O. O. Young, Henderson, N. C.	S. J. Stallings, Littleton, N. C.
2477		Carolina Milling Co., Weldon, N. C.	do
2707		M. G. Brown, Edenton, N. C.	A. T. Bush, Edenton, N. C.
2708		Elizabeth City Milling Co., Elizabeth City, N. C.	A. B. Seeley & Son, Elizabeth City, N. C.

That it has not been more generally used can be explained only in part. In the first place corn meal cannot be made into a light, porous loaf, as can flour from the wheat grain. Again, when reduced to meal on grinding, the oil of the grain soon becomes rancid and the meal loses its palatability.

Twenty-three samples of meal were analyzed. The per cent of ash and the microscopic examination showed all the samples to be pure corn meal.

Results of the examination of corn meal follow in the table:

NATION OF CORN MEAL.

Laboratory Number.	Date of Purchase.	Retail Price.	Ash.	Microscopic Examination Showed Sample to be—
1916	July 29, 1903	$ .75 per bushel	1.39 per cent.	Pure corn meal.
1923	July 31, 1903	do	1.26 per cent.	do.
1931	July 1, 1903	.80 per bushel	1.06 per cent.	do.
2005	July 15, 1903		1.25 per cent.	do.
2007	do	.75 per bushel	1.09 per cent.	do.
2008	July 16, 1903	.70 per bushel	1.33 per cent.	do.
2009	July 17, 1903	.75 per bushel	1.30 per cent.	do.
2010	July 29, 1903	do	1.32 per cent.	do.
2011	July 30, 1903	.72 per bushel	1.31 per cent.	do.
2012	do	.75 per bushel	1.18 per cent.	do.
2350	July 28, 1903	do	1.24 per cent.	do.
2351	July 30, 1903	.80 per bushel	1.30 per cent.	do.
2352	August 3, 1903	do	1.19 per cent.	do.
2353	August 5, 1903	do	1.26 per cent.	do.
2354	August 8, 1903	.75 per bushel	1.12 per cent.	do.
2355	do	do	1.23 per cent.	do.
2356	August 11, 1903	do	1.19 per cent.	do.
2357	do	do	do	do.
2358	August 12, 1903	do	1.12 per cent.	do.
2359	do	do	1.21 per cent.	do.
2447	do	.70 per bushel		do.
2707	August 4, 1903	1.00 per bushel	1.03 per cent.	do.
2708	August 14, 1903	.75 per bushel	.96 per cent.	do.

JELLIES, JAMS, MARMALADES, APPLE BUTTER AND PRESERVES.

By J. M. Pickel and F. C. Lamb.

Sixty-eight samples of these goods were examined; thirty-seven, or 54.4 per cent were found to be colored with coal-tar dyes; thirty-seven, or 54.4 per cent, contained preservatives, of which thirty-two, or 47 per cent, were benzoic acid, and five, or 7.4 per cent, were salicylic acid. Twenty-seven of the sixty-eight samples were sold as compound goods, and presumably contained in whole or in part glucose as a sweetener; the majority of these stated the per cent of glucose claimed, generally about 25 per cent, and of sugar 5 to 15 per cent. The remaining forty-one samples gave no intimation of the use of glucose; yet thirty-three, or 80.5 per cent of them were found to contain glucose. Glucose is usually made from corn starch, and when properly made

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2014	Quince	P. J. Ritter Conserve Co., Philadelphia, Pa.	P. H. Johnson, High Point, N. C.
2575	Currant	Chicago Syrup Refining Co., Chicago, Ill.	Sergeant-Clayton Co., Roxboro, N. C.
2762	Raspberry	Rockport Preserving Co.	----------
2764	Strawberry	J. A. Weller Co., Cincinnati, O.	----------
2975	----------	----------	M. Moses, Salisbury, N. C.
2986	Apple	Anderson Preserving Co., Camden, N. J.	Bridgers & Co., Charlotte, N. C.
3008	Highland Brand Raspberry.	Gibbs Preserving Co., Baltimore, Md	Fulmer & Whitehurst, Elizabeth City, N. C.
3009	Crescent Currant	Crescent Preserving Co., Camden, N. J.	do
3000	Carolina's Best Cranberry.	----------	B. W. Upchurch, Raleigh, N. C.
2996	Raspberry	P. C. Williams & Co., New York, N. Y.	M. Rosenthal & Co., Raleigh, N. C.
2988	XX Brand Currant	P. J. Ritter Conserve Co., Philadelphia, Pa.	J. R. Van Ness & Bro., Charlotte, N. C.
3004	Strawberry	Logan, Johnson & Co., Boston, Mass.	Old & Fearing, Elizabeth City, N. C.
3013	Queen City Blackberry.	J. A. Weller Co., Cincinnati, O.	----------
3001	Quaker	John Boyle Co., Baltimore, Md.	W. R. Dorsett, Raleigh, N. C.

is admittedly a wholesome article of food; but its presence should, in fairness to the consumer, be always made known; and goods containing it ought, other things being equal, to sell for less than goods sweetened with the more costly sugar.

Only one manufacturer stated on his labels that his goods were artificially colored, and he is to be commended for that; but none gave any intimation that coal-tar dyes or that benzoic or salicylic acids were used.

METHODS OF ANALYSIS.

About 30 g. of substance and 100 c. c. of water, strongly acidulated with phosphoric acid, were distilled down as low as possible in a short-neck flask. The last 75 to 80 c. c. of distillate were acidulated and shaken out with ether. The extract was tested with ferric chloride and by Mohler's test for salicylic and benzoic acids respectively. The test of Arata, as modified by A. L. Winton, was applied for coal-tar colors, a second woolen cloth being dyed in each case. See Bulletin No. 66, Bureau of Chem., pp. 22, 23, 24 and 26, U. S. Dept. of Agr.).

OF JELLIES NOT CLAIMING GLUCOSE.

Laboratory Number.	Quantity in Package.	Retail Price per Package—cents.	Polarization.				Sugar.	Coal-tar Color.	Preservatives.
			Direct.		After Inversion.				
			Reading.	Temp.—Deg. C.	Reading.	Temp.—Deg. C.			
2014	½ pint	25	—3.8	25	—10.6	25	Sucrose	Absent	Not found.
2575		5	100.6	24	98.6	24	Glucose	Present	do.
2762			100.8	24	73.8	24	do	Absent	do.
2764			114.	24	110.3	24	do	Present	do.
2975		15	—17.4	24	—23.10	24	Sucrose	Absent	do.
2986		10	65.6	24	61.4	24	Glucose	Present	do.
3008		10	132.6	23	129.8	23	do	do	do.
3009		10	106.6	25	118.	25	do	do	do.
3000		10	122.	23	121.2	23	do	do	do.
2996		25	—9.8	24	—18.6	24	Sucrose	Absent	do.
2988		30	5.2	23	—16.	23	do	Present	Benzoic acid.
3004		10	60.4	23	64.	23	Glucose	do	Not found,
3013			134.2	20	134.	20	do	Absent	do.
3001			126.4	23	125.2	23	do	Present	do.

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2650	Quaker Blackberry	John Boyle Co., Baltimore, Md.	Toxey & Gallup, Elizabeth City, N. C.
2968	Queen City Blackberry.	J. Weller & Co., Cincinnati, O.	S. E. Hudson, Greensboro, N. C.
2997	Eagle City Grape	Anderson Preserving Co., Camden, N. J.	M. Rosenthal & Co., Raleigh, N. C.
2792	Queen City Blackberry.	J. Weller & Co., Cincinnati, O.	
2991	Queen City Strawberry.	do	W. L. Pope, Charlotte, N. C.
2790	Currant Flavored	Williams Brothers & Charbonneau, Detroit, Mich.	
2791	Queen City Currant	J. Weller & Co., Cincinnati, O.	
2016	Queen City Blackberry.	do	W. H. Moffitt, Lexington, N. C.
2969	Pineapple	American Preserving Co., Philadelphia, Pa.	Shaw Bros. & Co., Greensboro, N. C.
2571	Homemade	Crystal Conserve Co., New York	R. S. Abernathy, Lincolnton, N. C.
2909	Queen City Grape	J. Weller & Co., Cincinnati, O.	J. R. Smith, Rockingham, N. C.
2577	Queen City Raspberry.	do	J. S. Brown, Oxford, N. C.
2992	Queen City Strawberry.	do	McManus, Sharp & Co., Charlotte, N. C.
2995	do	do	Miller & Campbell, Charlotte, N. C.
3006	Raspberry	Van Lill Preserving Co., Baltimore, Md.	Old & Fearing, Elizabeth City, N. C.
2981	Queen Quality Quince.	Thomas Preserving Co., New York, N. Y.	W. H. Walton, Salisbury, N. C.

TION OF COMPOUND JELLIES.

Laboratory Number.	Quantity in Package.	Retail Price.	Sugar Claimed.		Coal-tar Color.	Preservatives.
			Sucrose.	Glucose.		
2650	1 quart	10 cents per package			Present	Not found.
2968		do			do	do.
2997		15 cents per package			do	Benzoic acid.
2792					do	Not found.
2791		5 cents per package			do	do.
2790					do	do.
2791					do	do.
2016	½ pint	5 cents per package			do	Benzoic acid.
2969		10 cents per package			Absent	Not found.
2571		do			Present	Salicylic acid.
2909		5 cents per package			do	do.
2577		15 cents per package			do	do.
2992		10 cents per package			do	do.
2995		5 cents per package			do	do.
3006		10 cents per package			do	Not found.
2981		5 cents per package			Absent	do.

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
3002	Princess Raspberry	Princess Conserve Co., Camden, N. J.	W. R. Dorsett, Raleigh, N. C.
2576	Plum	Van Lill Preserving Co., Baltimore, Md.	Hugh Woods, Roxboro, N. C.
2998	Green Gage	Anderson Preserving Co., Camden, N. J.	M. Rosenthal & Co., Raleigh, N. C.
2977	"Republic" Raspberry.	Austin, Nichols & Co., New York, N. Y.	M. Moses, Salisbury, N. C.
2572	Raspberry	do	Cooper & Gill, Statesville, N. C.
2765	Republic	do	
2961	Princess	Princess Conserve Co., Camden, N. J.	Rankin Bros. Grocery Co., Greensboro, N. C.
2967	Red Raspberry	Williams Bros. & Charbonneau, Detroit, Mich.	S. E. Hudson, Greensboro, N. C.
2973	Old Virginia Apricot	George K. McMechen & Son, Wheeling, W. Va.	A. P. Grizzard, Winston, N. C.
3011	Raspberry	W. N. Clark & Co., Rochester, N. Y.	Fulmer & Whitehurst, Elizabeth City, N. C.

RESULTS OF THE EXAMINA

3012	Ivanhoe Strawberry	Crescent Preserving Co., Camden, N. J.	Fulmer & Whitehurst, Elizabeth City, N. C.
2970	Pineapple Southway	American Preserving Co., Philadelphia, Pa.	Shaw Brothers & Co., Greensboro, N. C.
2908	Highland Quince	Gibbs Preserving Co., Baltimore, Md.	W. G. Lowry, Rockingham, N. C.
2987	Lyon Brand	Hudson Preserving Co., New York, N. Y.	Nash & McGehee, Winston, N. C.

RESULTS OF THE EXAMI

2075	Cairnes' Orange	Alex. Cairnes & Son, Paisley, Scotland.	E. B. Hackburn, New Bern, N. C.
2570	Orange	Crosse & Blackwell, London, England.	Bruner & Huey, Monroe, N. C.
2963	Pure Orange	do	Rankin Bros. & Co., Greensboro, N. C.

RESULTS OF THE EXAMI

3003		H. J. Heinz & Co., Pittsburg, Pa.	Old & Fearing, Elizabeth City, N. C.

JAMS NOT CLAIMING GLUCOSE.

Laboratory Number.	Quantity in Package.	Retail Price per Package—cents.	Polarization.				Sugar. Contains—	Coal-tar Color.	Preservatives.
			Direct.		After Inversion.				
			Reading.	Temp.—Deg. C.	Reading.	Temp.—Deg. C.			
3002		15	111.4	17	107.4	17	Glucose	Present	Benzoic acid.
2576		13	122.6	17	120.4	17	do	Absent	Not found.
2998		20	80.2	19	60.8	19	do	do	do.
2977		25	76.6	20	69.2	20	do	do	Benzoic acid.
2572		20	81	22	81	22	do	do	do.
2765			84.2	22	62	22	do	do	do.
2961		15	93.4	22	79.4	22	do	do	do.
2967		20	68.2	22	66.8	22	do	do	Not found.
2973		20	77.8	22	54	22	do	do	Benzoic acid.
3011		18	33.8	22	26	22	do	do	do.

TION OF COMPOUND JAMS.

3012		10						Present	Benzoic acid.
2970		15						Absent	do.
2908		15						do	do.
2987		15						do	Benzoic and salicylic acids.

NATION OF MARMALADES.

2075	1 pint	25	0.0	24	—20	24	No glucose	Absent	Benzoic acid.
2570		25	8.8	22	—21.2	22	do	do	do.
2963		25	23.4	22	—22.8	22	do	do	Not found.

NATION OF APPLE BUTTER.

3003		10	—1.2	21	—1.8	21	No glucose	Present	Benzoic acid.

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2972	Victor Apricots	American Preserving Co., Philadelphia, Pa.	Shaw Bros. & Co., Greensboro, N. C.
2964	Strawberry	---do---	Fletcher & Rhodes, Greensboro, N. C.
2985	Maple Leaf Strawberry.	Williams Bros. & Charbonneau, Detroit, Mich.	Bridgers & Co., Charlotte, N. C.
2960	Monarch Preserved Ginger.	Reid, Murdock & Co., Chicago, Ill.	Rankin Bros. Grocery Co., Greensboro, N. C.
2958	Quince	Heinz & Co., Pittsburg, Pa.	---do---
3010	Family Fig	Joseph Campbell Preserving Co., Camden, N. J.	Fulmer & Whitehurst, Elizabeth City, N. C.
2649	Euchred Figs	H. J. Heinz Co., Pittsburg, Pa.	Toxey & Gallup, Elizabeth City, N. C.
2983	Red Currant	Ontario Preserving Co., Middleport, N. Y.	M. Moses, Salisbury, N. C.
2989	Seal Brand	R. J. Ritter Conserve Co., Philadelphia, Pa.	J. R. Van Ness & Bro., Charlotte, N. C.
2984	Red Raspberries	Heinz & Co., Pittsburg, Pa.	W. H. Wallace, Salisbury, N. C.
2573	Strawberry	Githens, Rexsamer & Co., New York.	Nash & McGehee, Winston, N. C.
2971	Fresh Fruit Plum	American Preserving Co., Philadelphia, Pa.	Shaw Brothers & Co., Greensboro, N. C.
2959	XX Brand Cherry	R. J. Ritter Conserve Co., Philadelphia, Pa.	Rankin Bros. Grocery Co., Greensboro, N. C.

RESULTS OF THE EXAMINATION

3005	Pan-American	Thomas Preserving Co., New York.	Old & Fearing, Elizabeth City, N. C.
2965	Queen City Gooseberry.	J. Weller & Co., Cincinnati, O.	Fletcher & Rhodes, Greensboro, N. C.
2962	Pomona Cherry	R. J. Ritter Conserve Co., Philadelphia, Pa.	Rankin Bros. Grocery Co., Greensboro, N. C.
2906	Queen City Peaches	J. Weller & Co., Cincinnati, O.	J. M. Smith, Rockingham, N. C.
2904	Queen City Red Raspberry.	---do---	---do---
2966	Tourist Raspberry	Avera Preserving Co., Detroit, Mich.	S. E. Hudson, Greensboro, N. C.
3007	Strawberry	Central Preserving Co., Boston, Mass.	Old & Fearing, Elizabeth City, N. C.

PRESERVES NOT CLAIMING GLUCOSE.

Laboratory Number.	Quantity in Package.	Retail Price per Package—cents.	Polarization.				Sugar. Contains—	Coal-tar Color.	Preservatives.
			Direct.		After Inversion.				
			Reading.	Temp.—Deg. C.	Reading.	Temp.—Deg. C.			
2972	----------	25	28.8	23	22	23	Glucose----	Absent----	Benzoic acid.
2964	----------	10	—12.4	23	—16.4	23	Invert sugar.	----do-----	Not found.
2985	----------	10	105.8	23	103.2	23	Glucose----	Present----	do.
2960	----------	30	61.6	23	34.4	23	----do-----	Absent----	do.
2958	----------	50	34	23	—8.4	23	Sucrose----	----do-----	do.
3010	----------	30	45.2	23	2	23	Glucose----	----do-----	Benzoic acid.
2649	1½ pt.---	60	29	24	—3.6	24	Sucrose----	----do-----	do.
2983	----------	25	31.8	24	26.8	24	Glucose----	Present----	do.
2989	----------	25	65.6	24	58.2	24	----do-----	----do-----	do.
2984	----------	50	29.4	24	—4.6	24	Sucrose----	----do-----	do.
2573	----------	45	36	22	2.4	22	Glucose----	----do-----	do.
2971	----------	20	38.2	22	35.2	22	----do-----	----do-----	do.
2959	----------	75	46	22	36	22	----do-----	----do-----	do.

OF COMPOUND PRESERVES.

3005	----------	10	----------	------	----------	------	----------	Present----	Benzoic acid.
2965	----------	25	----------	------	----------	------	----------	----do-----	do.
2962	----------	15	----------	------	----------	------	----------	Absent----	do.
2906	----------	15	----------	------	----------	------	----------	----do-----	do.
2904	----------	15	----------	------	----------	------	----------	Present----	do.
2966	----------	10	----------	------	----------	------	----------	Absent----	do.
3007	----------	------	----------	------	----------	------	----------	Present----	Not found.

BREAKFAST FOODS.

By F. C. Lamb.

Of late years breakfast foods have been growing more and more popular. The oatmeals have been used for a long time, but it is only recently that

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2138	Carolina Rice Flakes.	Carolina Rice Mills, Goldsboro, N. C.	W. D. LaRoque, Jr., Kinston, N. C.
2139	Arena Rolled Oats	American Cereal Co., Chicago, Ill.	do
2141	Cream of Wheat	Cream of Wheat Co., Minneapolis, Minn.	do
2142	Fancy Carolina Regal Rice.	Charleston Importing and Export Co., Charleston, S. C.	do
2144	Presto	H. O. Hornby's Oatmeal Co., Buffalo, N. Y.	do
2146	Force	Force Food Co., Buffalo, N. Y.	do
2147	Granulated Hominy	American Cereal Co., Chicago, Ill.	do
2151	Quaker Oats	do	W. H. Moffitt, Lexington, N. C.
2653	Pettijohn's Breakfast Food.	do	A. T. Bush, Edenton, N. C.
2654	Cera Nut Flakes	National Pure Food Co., Grand Rapids, Mich.	do
2655	Voight Cream Flakes	Voight Cereal Food Co., Grand Rapids, Mich.	Toxey & Gallup, Elizabeth City, N. C.
2656	Tryabita	Price Cereal Food Co., Battle Creek, Mich.	J. G. Fearing & Co., Elizabeth City, N. C.
2802	Malta-Vita	Pure Food Co., Battle Creek, Mich.	W. I. Everett, Rockingham, N. C.
2806	Biltmore Wheat Hearts.	Wheat Hearts Co., Asheville, N C.	Cooper & Gill, Statesville, N. C.
2807	Wheatlet	Franklin Mills Co., Lockport, N. Y.	Bost & Newton, Hickory, N. C.
2808	Shredded Whole Wheat.	The National Food Co., Niagara Falls, N. Y.	Nash & McGehee, Winston, N. C.
2809	Wheatena	The Health Food Co., New York, N. Y.	W. I. Everett, Rockingham, N. C.
2812	Grape Nuts	Postum Cereal Co., Battle Creek, Mich.	N. H. Shearin, Littleton, N. C.
2815	Derby Prepared Buckwheat.	Stokes-Grymes Grocery Co., Richmond, Va.	Sergeant-Clayton Co., Roxboro, N. C.
2871	*Hominy	Van Kamp Packing Co., Indianapolis, Ind.	Bruner & Huey, Monroe, N. C.
2140	†Tapioca	R. C. Williams & Co., New York, N. Y.	W. D. LaRoque, Jr., Kinston, N. C.
2149	†Pearl Tapioca	Austin, Nichols & Co., New York, N. Y.	W. H. Moffitt, Lexington, N. C.
2185	†Monogram Tapioca.	Bennett, Sloan & Co., New York, N. Y.	Cannon-Fetzer Co., Concord, N. C.

*Analysis of partially dried sample.

†Three samples of Tapioca were examined microscopically by Mr. Harris and were found to be pure cassava starch.

preparations made from rice, wheat, corn, etc., have come into general use. The breakfast foods derived from oats have a greater food value than those foods derived from the other cereals. These are all good, but they are not complete foods, as claimed by some of the manufacturers. In some cases the prices are very high. Sample No. 2815 contains a phosphate material for leavening purposes.

OF BREAKFAST FOODS.

Laboratory Number.	Date of Purchase.	Weight of Package—lbs.	Retail Price per Package—cts.	Results of Chemical Examination.					
				Water, Per cent.	Ash, Per cent.	Protein, Per cent.	Fat, Per cent.	Nitrogen Free Extract, Per cent.	Crude Fiber, Per ct.
2138	July 16, 1903	------	15	10.19	.34	7.88	.50	80.77	.32
2139	----do	------	10	8.70	1.69	16.44	7.42	63.02	2.73
2141	----do	2	15	9.88	.50	15.94	.87	72.37	.44
2142	----do	3	25	10.73	.52	10.31	.46	77.62	.36
2144	----do	1	10	9.72	3.09	11.69	.53	74.76	.21
2146	----do	2	15	9.15	3.09	12.63	1.45	71.77	1.91
2147	----do	5	20	9.88	.40	10.75	.45	78.06	.46
2151	July 31, 1903	2	15	8.58	1.89	16.88	7.32	64.14	1.19
2653	August 4, 1903	2	15	8.84	1.44	12.94	1.82	73.03	1.93
2654	----do	1	15	9.24	2.10	13.44	1.79	71.07	2.36
2655	August 14, 1903	1	15	9.20	2.18	10.56	1.43	74.63	2.00
2656	August 15, 1903	1	15	9.18	3.09	10.81	1.64	73.28	2.00
2802	------	------	------	8.64	2.46	12.00	1.04	74.40	1.46
2806	July 31, 1903	2	15	9.05	.61	12.81	1.57	75.18	.78
2807	July 29, 1903	2	15	9.84	.80	15.75	1.60	71.30	.71
2808	August 3, 1903	------	15	9.12	1.52	11.50	1.32	74.46	2.08
2809	July 22, 1903	------	20	8.01	1.20	15.38	2.36	72.40	.65
2812	July 12, 1903	------	15	6.98	1.92	12.94	.76	75.63	1.77
2815	August 8, 1903	2	20	9.47	6.58	12.00	2.39	68.79	.77
2871	July 24, 1903	2 (in can)	15	6.31	1.26	9.88	2.79	79.33	.43
2140	July 16, 1903	------	10	----------	----------	----------	----------	----------	--------
2149	July 31, 1903	1	15	----------	----------	----------	----------	----------	--------
2152	August 1, 1903	1	10	----------	----------	----------	----------	----------	--------

PHOSPHATES, MALTS, WINES, BEERS, WHISKEYS, CIDERS AND TONICS.

By W. M. Allen.

These samples, thirty in number, and rather miscellaneous, were sent to the department to be tested for alcohol and adulterants by individuals and city officials, except the beers, which were purchased by an officer of the Department.

Four of these samples, Nos. 1789, 1880, 1788 and 1881, were sold for soft or nonalcoholic drinks. By reference to the table below it will be seen that they all contain alcohol, ranging from 2.63 per cent to 15.85 per cent, the lowest containing more than half as much alcohol as an average beer, and the highest, one-third as much as an average whiskey. Nineteen of these samples contain salicylic acid as a preservative, and Nos. 1788, 2924 and 2905 con-

RESULTS OF THE EXAMINATION OF PHOSPHATES,

Laboratory Number.	Name of Article and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1789	Orange Phosphate		D. C. High, Louisburg, N. C.
1880	Apricot Cider		Sent by J. S. Koiner, bought of R. R. & C. R. Brady, Conover, N. C.
1788	California Nectar		D. C. High, Louisburg, N. C.
1881	Grape Phosphate		Sent by J. S. Koiner, bought of E. A. Herman, Conover, N. C.
2795	Malt Tivoli	Robert Portner Brewing Co., Alexandria, Va.	Sent by M. T. Breazeale, Mount Olive, N. C.
2794	Acme Malt		do
2924	Cider		Leroy Ballenger, Blowing Rock, N. C.
2509	Port Wine		Croon Bros., Maxton, N. C.
2496	Wine No. 1		Sent by M. Bell, Fayetteville, N. C.
2497	Wine No. 2		do
2498	Wine No. 3		do
3068	"Imperial" Wine	Garrett & Co., Weldon, N. C.	Acme Wine Co., Raleigh, N. C.
1854	Original Budweiser Beer.	Anheuser-Busch Brewery Co., St. Louis, Mo.	E. V. Denton, Raleigh, N. C.
1855	Hoster-Wiener Beer	L. Hoster Brewing Co., Columbus, Ohio.	do
1856	Vienna Cabinet Beer.	Robert Portner Brewing Co., Alexandria, Va.	do
1857	Pabst Export Beer	Pabst, Milwaukee, Richmond Branch.	Miller & West, Raleigh, N. C.
1858	Pinnacle Export Lager Beer.	New South Brewery and Ice Co., Middlesboro, Ky.	W. D. Bright & Co., Raleigh, N. C.
1859	Hofbrau Lager Beer	Portner Brewing Co., Alexandria, Va.	P. B. Griffis, Raleigh, N. C.
1860	Schlitz Export Beer	Joseph Schlitz Brewing Co., Milwaukee, Wis.	S. T. Smith, Raleigh, N. C.

tained it in very large quantity. If a chemical preservative is to be used at all in such beverages, salicylic acid is probably the least objectionable. And we would say that a beverage in good condition, containing a small amount, say not more than 5 grs. per gallon, would be better and less objectionable than one in bad condition with no preservative. Nos. 2509 and 2924 showed indications of being artificial wines, the former containing a coal-tar dye as artificial coloring matter. The quantity of preservative in the beers was not determined. Nos. 1818 and 1819 were found to contain caramel as coloring matter, but as it is not injurious to health it is not considered objectionable. No. 1734, a whiskey, appears to be adulterated with a small amount of potash lye to give it bead. This form of adulteration is very objectionable. It is not only nauseating, but the alkali attacks the delicate linings of the alimentary tract.

METHODS OF ANALYSIS.

The provisional methods of the Association of Official Agricultural Chemists were employed, except in the quantitative determination of salicylic acid.

MALTS, WINES, BEERS, WHISKEYS, CIDERS AND TONICS.

Laboratory Number.	Retail Price per Bottle—cents.	Amount Contained in Bottle.	Alcohol—per cent by Vol.	Acidity—Acetic Acid—per cent.	Total Solids—per cent.	Ash—per cent.	Preservatives.	Coloring Matter.
1789	------	-------	8.95	--------	12.23	--------	----------	
1880	10	1 pint	10.65	--------	14.33	--------	Salicylic acid, 5 grs. per gallon.	
1788	------	-------	15.85	--------	14.75	--------	Salicylic acid, 9.5 grs. per gallon.	
1881	10	1 pint	2.63	--------	20.65	--------	----------	
2795	------	-------	4.70	--------	4.69	0.43	Salicylic acid, 3.4 grs. per gallon.	
2794	------	-------	2.92	--------	5.86	0.24	----------	
2924	------	-------	9.60	--------	13.70	--------	Salicylic acid, 30 grs. per gallon.	
2509	------	-------	10.30	1.23	10.30	--------	Salicylic acid, 10 grs. per gallon.	Coal-tar dye.
2496	------	-------	6.15	0.77	7.20	--------	Salicylic acid, 2 grs. per gallon.	
2497	------	-------	5.60	0.68	6.23	--------	Salicylic acid, 1.50 grs. per gallon.	
2498	------	-------	1.45	1.90	2.28	--------	Salicylic acid, 1.50 grs. per gallon.	
3068	------	-------	11.30	--------	21.60	--------	Salicylic acid, 2.50 grs. per gallon.	
1854	15	1 pint	3.93	--------	5.06	--------	Salicylic acid----------	
1855	15	--do--	4.45	--------	5.28	--------	Salicylic acid----------	
1856	------	-------	4.30	--------	4.07	--------	Salicylic acid----------	
1857	15	1 pint	2.92	--------	6.07	--------	Salicylic acid----------	
1858	15	--do--	4.42	--------	4.83	--------	----------	
1859	10	--do--	4.65	--------	4.32	--------	Salicylic acid----------	
1860	15	--do--	4.40	--------	4.86	--------	Salicylic acid----------	

RESULTS OF THE EXAMINATION OF PHOSPHATES, MALTS,

Laboratory Number.	Name of Article and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1861	Pabst Bock Beer	Pabst, Milwaukee, Wis.	S. T. Smith, Raleigh, N. C.
1868	Jungs Pilsener Beer	Jungs Brewing Co., Cincinnati, Ohio.	J. R. Ferrall & Co., Raleigh, N. C.
1869	Vienna Cabinet Beer	Portner Brewing Co., Alexandria, Va.	Portner Bottling Works, Raleigh, N. C.
1873	Hoster's Beer	W. Mangum, Jr., Agent, Durham, N. C.	R. C. Batchelor, Raleigh, N. C.
1874	Pabst Beer	Pabst, Milwaukee, Richmond Branch.	W. H. Broughton, Raleigh, N. C.
1818	Whiskey No. 1	----------	A. J. Jordan, Depot Manager, Seaboard, N. C.
1819	Whiskey No. 2	----------	do
1734	Whiskey	----------	A. L. Quickel, Lincolnton, N. C.
1817	Gin	----------	A. J. Jordan, Depot Manager, Seaboard, N. C.
1853	Oxolo	Oxolo Chemical Co., Providence, R. I.	E. R. Pool, Raleigh, N. C.
1886	Peruna	Peruna Medicine Co., Columbus, Ohio.	W. H. King Drug Co., Raleigh, N. C.

WINES, BEERS, WHISKEYS, CIDERS AND TONICS—CONTINUED.

Laboratory Number.	Retail Price per Bottle—cents.	Amount contained in Bottle.	Alcohol—per cent by Vol.	Acidity—Acetic Acid—per cent.	Total Solids—per cent.	Ash—per cent.	Preservatives.	Coloring Matter and Remarks.
1861	15	1 pint	4.55		7.30		Salicylic acid	
1868	10	do	4.40		5.04			
1869			4.95		3.98		Salicylic acid	
1873	20	1 qt.	5.25		5.43		Salicylic acid	
1874	15	do	4.30		5.54		Salicylic acid	
1818			42.15		0.15	0.01		Caramel.
1819			45.15		0.37	0.05		Caramel.
1734			48.35		0.65			Slightly alkaline, indicating that a small amount of potash had been added to give it bead.
1817			42.30		0.03	0.10		
1853	35	1 pint	18.05					
1886			25.65					

NONALCOHOLIC DRINKS.

By F. C. Lamb.

Twenty samples of sodas, grape juices, etc., were examined for preserva-

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2095	Root Beer	Clawson Co., Philadelphia, Pa.	E. B. Hackburn, New Bern, N. C.
2096	Ginger Ale	Imported by F. H. Leggett Co., New York.	do
2590	Ironbrew	Crown Bottling Works, Reidsville, N. C.	W. P. Ware, Reidsville, N. C.
2591	Cream Soda	H. L. Sprenkle & Co., Reidsville, N. C.	do
2626	Peach Soda	J. F. T. Steger, Elizabeth City, N. C.	Morgan & Dawes, Elizabeth City, N. C.
2627	Strawberry Soda	S. Waters & Co., Elizabeth City, N. C.	do
2628	Ginger Soda	do	do
2629	Lemon Soda	do	do
2630	Vanilla Cream Soda	do	do
2903	Coca-Cola	Coca-Cola Co., Atlanta, Ga.	H. H. Smith, Rockingham, N. C.
2789	Sterling Cream Soda	Wadesboro Bottling Works, Wadesboro, N. C.	——, Wadesboro, N. C.
2902	Ginger Ale	Hamlet Bottling Works, Hamlet, N. C.	H. H. Smith, Rockingham, N. C.
2586	Vanilla Soda	Hickory Bottling Works, Hickory, N. C.	Campbell & Havner, Newton, N. C.
2093	Golden Arbor Grape Juice.	F. H. Leggett Co., New York, N. Y.	E. B. Hackburn, New Bern, N. C.
2094	Grape Juice	F. A. Brock, Vineland, N J.	do
1692	Grape Juice	Vineland Grape Juice Co., Vineland, N. J.	Rankin Bros. Grocery Co., Greensboro, N. C.
2092	Bowker's Orangeade	H. L. Bowker Co., Boston, Mass.	W. H. Moffitt, Lexington, N. C.
2089	Lime Juice	Unfermented Juice and Cider Co., Winchester, Va.	E. B. Hackburn, New Bern, N. C.
2090	Orange Juice	do	do
2088	Lemon Juice	do	do

tives and coloring matters. Samples Nos. 2095, 2096 and 1692 contained salicylic acid. Nos. 2902 and 2586 contained formaldehyde. Nos. 2626, 2627 and 2092 contained coal-tar dyes. Nos. 2903 and 2590 contained small amounts of caramel. This is probably accidental.

BOTTLED NONALCOHOLIC DRINKS.

Laboratory Number.	Date of Purchase.	Quantity in Bottle.	Retail Price per Bottle—cents.	Total Solids—Per cent.	Preservatives.	Coloring Matter.
2095	July 15, 1903	1 quart	15	7.65	Salicylic acid	
2096	do	⅛ pint	15	6.76	do	
2590	August 5, 1903	½ pint	10	10.72		Caramel.
2591	do	do	10	8.08		
2626	August 14, 1903	do	5	10.02		Reddish-brown coal-tar dye.
2627	do	do	5	7.66		Red coal-tar dye.
2628	do	do	5	8.59		
2629	do	do	5	8.72		
2630	do	do	5	8.82		
2903	August 31, 1903	do	5	4.94		Caramel.
2789		do		4.39		
2902	do	do	5	3.37	Formaldehyde	
2586	July 30, 1903	do	10	3.62	do	
2093	July 15, 1903	1 quart	50	12.63		
2094	do	1 pint	30	16.73		
1692	Sept. 16, 1903	do	30	16.66	Salicylic acid	
2092	July 31, 1093	½ pint	10	33.02		Yellow coal-tar dye.
2089	July 15, 1903	1 pint	25	.59		
2090	do	do	25	1.93		
2088	do	do	25	.66		

COFFEE.

By C. D. Harris.

Thirty-eight samples of roasted coffees have been examined. The following contained foreign material:

No. 2098, Coffee stems. No. 2101, Coffee stems. No. 2103, Pebbles, pieces of wood and coffee stems. No. 2109, Pebbles. No. 2111, Trash. No. 2113, Peb-

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2097	Santora	Chase & Sanborn, Boston, Mass.	E. B. Hackburn, New Bern, N. C.
2098	Choice Roasted	Charleston Import and Export Co., Charleston, S. C.	do
2099	Excelsior	do	do
2100	Lyon	Woolser Spice Co., Toledo, Ohio.	W. D. LaRoque, Jr., Kinston, N. C.
2101	Good Luck	Aragon Coffee Co., Richmond, Va.	do
2103	Ariosa	Arbuckle Brothers, New York, N. Y.	do
2105		Thompson & Taylor Spice Co., Chicago, Ill.	P. H. Johnson, High Point, N. C.
2106		New York Coffee Co., New York, N. Y.	do
2107		do	do
2108		Thompson & Taylor Spice Co., Chicago, Ill.	do
2109	Cordova	Dannemiller & Co., New York, N. Y.	Fouts & Grimes, Thomasville, N. C.
2110	Ariosa	Arbuckle Brothers, New York, N. Y.	W. H. Moffitt, Lexington, N. C.
2111	Prime Roasted	Jeffress & Shelton, Richmond, Va.	do
2113	Melrose	Cannon-Fetzer Co., Concord, N. C.	Cannon-Fetzer Co., Concord, N. C.
2114	Morning Glory	Charleston Import and Export Co., Charleston, S. C.	do
2115	Java and Mocha	Chase & Sanborn, Boston, Mass.	E. B. Hackburn, New Bern, N. C.
2116	Java and Mocha (Our Own).	E. B. Hackburn, New Bern, N. C.	do
2361	Arbuckle's	Arbuckle Bros., New York, N. Y.	Cooper & Gill, Statesville, N. C.
2362	Santos	W. P. Ware, Reidsville, N. C.	W. P. Ware, Reidsville, N. C.
2365	Levering	E. L. Levering & Co., Baltimore, Md.	J. S. Brown, Oxford, N. C.
2366	Monogram	Charleston Supply and Export Co., Charleston, S. C.	do
2367	Bonita	Chase & Sanborn, Boston, Mass.	R. B. Powell, Henderson, N. C.
2368	Our Blend	do	do
2369	Ariosa	Arbuckle Bros., New York,	Eugene Johnson, Littleton, N. C.

bles. No. 2362, Pebbles and stems. No. 2365, Coffee stems. No. 2371, Pieces of wood and stems. No. 2372, Some pieces of wood. No. 2766, Coffee stems. No. 2891, Pebbles, pieces of wood and coffee stems. No. 2892, Trash, coffee stems and pebbles. No. 2933, Stems and pebbles. No. 2936, Pebbles. No. 2938, Pebbles.

Thirteen samples contained 7 to 10 per cent and nine samples contained 4 to 6 per cent of broken and damaged coffee, and two samples contained 14 and 24 per cent respectively of such coffee. One sample contained 26 per cent of immature coffee; seven samples contained 7 to 11 per cent, and 14 samples 4 to 6 per cent.

NATION OF COFFEE.

Laboratory Number.	Date of Purchase.	Retail Price per Pound—cents.	Glazing Water Extract—per cent.	Broken and Damaged Coffee—per cent.	Immature Coffee—per cent.	Adulterants.
2097	July 15, 1903	20	1.15	1.5	4.00	
2098	----do-------	15	1.77	4.00	8.00	Coffee stems.
2099	----do-------	15	1.72	5.00	3.5	do.
2100	July 16, 1903	12.5	1.45	7.00	2.5	
2101	----do-------	10	----------	5.5	4.0	do.
2103	----do-------	12.5	2.30	10.0	7.0	Pebbles, pieces of wood and coffee stems.
2105	July 30, 1903	25	3.79	----------	4	
2106	----do-------	15	1.26	1.00	1.00	
2107	----do-------	20	1.96	2.00	------ ---	
2108	----do-------	30	1.75	2	5.00	
2109	----do-------	11	2.53	5.5	9.00	Pebbles.
2110	July 31, 1903	12.5	1.10	8.0	3.5	
2111	----do-------	11.0	.90	7.0	8.0	Trash.
2113	Aug. 1, 1903	12.5	1.50	5.0	5.0	Pebbles.
2114	----do-------	15	1.47	6.0	4.0	
2115	July 15, 1903	35	.8	1.5	1.0	
2116	July 15, 1903	25	.95	1.5	1.0	
2361	July 31, 1903	15	1.60	7.0	11.0	
2362	Aug. 5, 1903	15	----------	8.00	6.0	Pebbles and stems.
2365	Aug. 10, 1903	12	1.30	7.00	3.0	Coffee stems.
2366	----do-------	35	----------	1.00	1.5	
2367	Aug. 11, 1903	25	1.60	1.5	2.5	
2368	----do-------	35	----------	----------	----------	
2369	Aug. 12, 1903	15	.71	----------	----------	

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2370	Cook's Choice	A. Blair & Sons, Richmond, Va.	J. R. Powers & Co., Littleton, N. C.
2371	Rio	Jeffress & Shelton, Richmond, Va.	J. H. Harrison & Co., Littleton, N. C.
2372	15 Diamond	E. A. Saunders & Son (Brokers), Richmond, Va.	S. J. Stallings, Littleton, N. C.
2721	Porto Rico	Nashville Coffee and Mfg. Co., Nashville, Tenn.	——, Asheville, N. C.
2766	Star	Dannemiller & Co., Canton, O.	——, Wadesboro, N. C.
2768	Straight	Aragon Coffee Co., Richmond, Va.	do
2891	Lyon	Woolson Spice Co., Toledo, O.	J. M. Smith, Rockingham, N. C.
2892		Jeffress & Shelton (Jobbers), Richmond, Va.	W. G. Lowry, Rockingham, N. C.
2933	Roasted Santos	Aragon Coffee Co., Richmond, Va.	J. M. Smith, Rockingham, N. C.
2934	Roasted BB	do	do
2935	Green	do	W. G. Lowry, Rockingham, N. C.
2936		Albert Mackie Grocery Co., New Orleans, La.	do
2937		D. L. Gore, Wilmington, N. C.	do
2938			do

TION OF COFFEE—CONTINUED.

Laboratory Number.	Date of Purchase.	Retail Price per Pound—cents.	Glazing Water Extract—per cent.	Broken and Damaged Coffee—per cent.	Immature Coffee—per cent.	Adulterants.
2370	----------	12.5	1.88	8.00	5.00	
2371	Aug. 12, 1903	15.00	1.70	10.00	5.00	Pieces of wood and pebbles.
2372	----do-------	15	1.57	4.00	4.5	Some pieces of wood.
2721	----------	----------	1.96	9.1	8.00	
2766	----------	----------	1.85	5	6.00	Coffee stems.
2768	----------	----------	1.29	9	4	
2891	Aug. 31, 1903	15	1.41	10	7	Pebbles, pieces of wood and coffee stems.
2892	----do-------	15	1.25	7.5	41	Trash, coffee stems and pebbles.
2933	----do-------	10	----------	24	26	Stems and pebbles.
2934	----do-------	10	1.67	4	6	
2935	----do-------	12.5	----------	1.00	1.5	
2936	----do-------	10	----------	1.00	1.00	Pebbles.
2937	----do-------	10	----------	1.00	1.00	
2938	----do-------	7.5	----------	14.00	2.00	Pebbles.

TEAS.

By C. D. Harris.

Twenty-one teas have been examined. The percentage of total and water insoluble ash shows whether or not the tea contains an undue amount of sand or mineral make-weights, and the percentages of hot-water extract and water-

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
2117	Hackburn's Mixed	E. B. Hackburn, New Bern, N. C.	E. B. Hackburn, New Bern, N. C.
2118	Choice No. 20 Blend	do	do
2119	Royal Seal	Bohea Import Co., Baltimore, Md.	do
2120	Ceylon	do	do
2121	Royal Crest	do	do
2122	Pagoda	Pagoda Tea Co., Baltimore, Md.	do
2123	Silver Leaf	Peking Spice Co., Cincinnati, O.	W. D. LaRoque, Jr., Kinston, N. C.
2124	Emperors	Chase & Sanborn, Boston, Mass.	J. W. Harris & Co., High Point, N. C.
2125	Ko-Walla	O and O Tea Co., New York, N. Y.	do
2126	Wings Brand	R. C. Williams & Co., New York, N. Y.	W. H. Moffitt, Lexington, N. C.
2127	Mixed	Heekins Spice Co., Cincinnati, O.	do
2182	Gunpowder	Bohea Import Co., Baltimore, Md.	E. B. Hackburn, New Bern, N. C.
2374	Premier	F. H. Leggett & Co., New York, N. Y.	W. I. Everett, Rockingham, N. C.
2375	Lipton's	Lipton, New York, N. Y.	Bruner & Huey, Monroe, N. C.
2376	Leggett's Blend	F. H. Leggett & Co , New York, N. Y.	Cooper & Gill, Statesville, N. C.
2377		W. G. Garsed, Philadelphia, Pa.	W. P. Ware, Reidsville, N. C.
2378	Emperors Blended	Chase & Sanborn, Boston, Mass.	R. P. Powell, Henderson, N. C.
2379	Silver Star	Martin, Gillett & Co., Baltimore, Md.	J. H. Harrison & Co., Littleton, N. C.
2677	Mixed Tea	Pagoda Tea Co., Baltimore, Md.	A. B. Seeley & Son, Elizabeth City, N. C.
2717	Premier	F. H. Leggett & Co., New York, N. Y.	
2718	Boka	Reed, Murdock & Co., Chicago, Ill.	

soluble ash indicate whether or not there is any considerable amount of exhausted leaves. From analyses of tea made elsewhere and the standard adopted in other countries it would appear that genuine tea contains not more than 8 per cent of total ash, not less than 3 per cent soluble ash and not less than 30 per cent of extract.

Results.—Two samples, Nos. 2117 and 2377 fell below the standard in hot-water extract, and samples Nos. 2119, 2377, 2378, 2379 and 2717 are below standard in soluble ash, and would appear to contain a small quantity of exhausted leaves.

NATION OF TEAS.

Laboratory Number.	Date of Purchase.	Retail Price—per pound.	Water—per cent.	Ash—per cent.			Hot-water Extract.	Remarks.
				Total.	Insoluble in Water.	Soluble in Water.		
2117	July 15, 1903	40	9.70	5.90	2.52	3.38	29.41	Faced with Prussian blue.
2118	do	40	9.26	6.03	2.50	3.53	31.19	
2119	do	80	9.37	5.55	2.57	2.98	37.11	
2120	do	80	11.90	5.25	2.02	3.23	33.35	
2121	do	60	8.10	5.52	2.10	3.40	36.80	
2122	do	40	10.23	5.72	1.50	4.22	31.02	
2123	July 16, 1903	40	-------	6.07	3.00	3.07	-------	
2124	July 30, 1903	40	8.14	5.67	2.58	3.09	38.79	
2125	do	60	11.5	5.00	1.94	4.06	34.81	
2126	July 31, 1903	40	7.79	5.37	2.12	3.25	35.37	
2127	do	50	8.75	5.03	2.62	3.41	36.17	
2182	July 15, 1903	80	7.31	6.09	2.42	3.67	51.07	
2374	July 22, 1903	60	7.30	5.95	3.10	3.43	43.47	
2375	July 24, 1903	35	9.67	5.57	2.52	3.05	41.10	
2376	July 31, 1903	60	7.77	6.17	2.67	3.50	39.26	
2377	Aug. 5, 1903	50	10.50	5.97	3.11	2.86	26.75	
2378	Aug. 11, 1903	70	8.26	5.25	2.27	2.98	38.42	Faced with Prussian blue.
2379	Aug. 12, 1903	40	9.24	5.87	3.27	2.60	34.76	
2677	Aug. 14, 1903	40	9.15	5.72	2.22	3.50	32.68	
2717	-------	------	7.65	5.90	2.97	2.93	41.04	
2718	-------	------	7.37	5.90	2.50	3.40	38.73	

UPLAND RICE CULTURE.

By G. W. Sanderlin.

1. *The kind of soil suitable to the growth of rice.* Rice may be grown, but will not fruit well, on very light soil. It prefers moist loams and the lighter clays. The soils along our rivers, creeks and branches, mud bottoms, marsh lands when drained and not too much inclined to peat, and second lowlands, if not too stiff, are well adapted to it. It can be grown, and, sometimes, with favorable seasons, very successfully, on high, dry uplands of good quality, but its culture there is hardly to be recommended. There are many pond places on uplands that will not bring corn, but will bring very good rice and abundantly, too, particularly if cowpenned or if cowpen manure is used. I planted in marsh land lying along Bear Creek (Wayne County). It was a singular fact in my experience that on barren spots in this land where, when planted in corn, it would "french" and not make a barrel to the acre, I made as good rice as anywhere else. But to make sure of a yield in such places I would recommend the application of lime or bonedust, or both, in greater or less quantities. An application of acid phosphate and kainit in proportions of two to one is an admirable combination for rice on almost any soil. Good crops of rice can be made for two or three years successively on pine land freshly cleared. A word of caution as to drainage of lowlands: Many persons who planted rice at first seemed to think that, as rice demands a plentiful supply of moisture, any lands answering to this condition would be suitable and produce an abundant yield. Consequently many acres of low, undrained land were devoted to its cultivation. This was a mistake. *Rice lands should be thoroughly drained.* Rice is a crop that does, indeed, need plenty of moisture, but the moisture must not be so supplied as that the land shall be soured or "sobby." If, in the draining of your land, you can so arrange your ditches as to let the water on and off your rice, so much the better. It renders you thereby independent of the seasons; whether they be wet or dry, if you manage aright, you are almost absolutely certain of an abundant crop in the fall.

2. *The time for planting.* Rice may be safely planted as early as the last week in March and as late as the middle of May. I should much prefer to plant about the first or second week in April (the third week will do quite as well), observing about the following order—first, plant upland corn from 20th to 31st of March; then plant rice from 1st to 15th of April (if it is cut down by frost it will come again); then plant cotton. By the time you are through with planting cotton, or soon after, your corn may be replanted; then your rice will be ready for you to pay your respects to it; and then your first chopping of cotton. Of course the time of planting will be regulated by the time each one may have fixed in his mind as being the best for planting corn, cotton, etc. I have merely indicated a rotation, and mean to be understood as intimating that when your rice needs you it *needs you and must have your attention*, and you must so plant your crop as that when the rice needs its *first working* (the most important of all), it shall have it *without a day's*

delay. It is very exacting in this regard. It is a smaller growth at the beginning than cotton, and of course if your cotton must be freed from the grass promptly, much more your rice. I will add that a tolerably early planting of rice is desirable, in order that the grain may thoroughly ripen before frost strikes it in the fall.

3. *The kind of seed to be planted.* There are two general varieties of rice with multitudinous subvarieties, namely, the gold rice (golden chaff, as our Cape Fear friends call it), and the white rice. The former will not shatter near as badly as the latter, but grows best in water culture, *i. e.*, where you are able to irrigate your land by flooding as in the regular rice regions. The white rice grows equally well with either wet or dry culture. It is highly prized at the rice mills. The golden chaff, the kind used in cultivation by irrigation, matures two or three weeks later in the fall when used on uplands than white rice, and is, therefore, not desirable for upland planting. It is important that the planter should get good seed; and what the rice planter means by good seed is simply sound, well-ripened seed, free from mixture with volunteer rice. Volunteer rice is red rice, and its presence injures the market value; but worse than that, it ripens sooner than the other rice and falls out, causing in this way often the loss of a considerable percentage of the crop. It will generally take about two pecks to the acre, though if you already have it in hand from a previous crop three is better than two, since if you have too heavy a stand, it can be chopped out, or better still, replanted with small paddles in missing places, while, if you do not have a sufficient stand, the deficiency may be beyond remedy. Upland rice for seed may be bought of commission merchants or at the rice mills at Goldsboro, Wilmington, Charleston, etc. Be sure to inquire for white rice for upland planting. Seed rice costs more than the ordinary rice for market purposes, but it pays to get the best.

4. *Preparation of the ground and planting.* A neighboring farmer who had considerable experience in rice culture, and followed his plans successfully for several years, advised that the ground be broken up, then laid off in furrows three feet apart, and when the time comes for planting drop in hills and bed up lightly by throwing two furrows. Just before the rice comes up take a common cotton coverer and run over it, which will destroy the young grass without injuring the rice, and is equal to the first chopping. A rice farmer in South Carolina advised a somewhat similar plan *if the land is warm and dry.* But if the land is *cold or wet*, he recommended bedding up and planting just as in cotton. I prefer the latter plan under any circumstances. Several friends in Lenoir County tried the former plan of planting in a level furrow and then bedding on the rice, and gained a widespread reputation for disinterested and far-reaching philanthropy in that their crops were planted, as their neighbors supposed, for the benefit of the Chinese and Burmese on the other side of the globe (noted rice eaters, you know), as the crops were not seen on this side.

Bed up your land as for cotton-rows three to three and one-half, or even four feet apart, according to the richness of the soil. Take a cotton plow with front off—run your furrows—drop in the furrow in hills twelve to fourteen inches apart (wide enough to work between with hoe easily) at least thirty grains to the hill, and cover *lightly* with hoe, or, better still, with common cotton coverer. Some recommend fewer grains to the hill and allow for

shoots or stooling. But that is to be avoided, because when enough seed are used to produce at once all the stalks the land can bear the rice will head out and ripen with more uniformity; and this is a matter of not a little importance. The dropping of the rice is tedious and tiresome, but you can by this method be certain of what you are doing, which you cannot be with a machine, that is, with such rice planters as have been brought to my attention. Employ cheap labor—little colored boys and girls—furnish them with buckets and watch them closely and see that they drop in hills the right distance, about thirty or forty grains to the hill. A little practice will make them very expert at the business.

The rice will be up in three or four weeks if the weather be warm. Care must be taken for some time, until the grain rots off, to protect from the depredations of the birds or they will destroy your stand before you are aware of it. A dollar or two spent just here in powder and shot and in the employment of a boy to keep the birds away will amply repay you. Let the first working be with a side-harrow or scraper just as soon as it is fairly through the ground. Then, when it is two or three inches high, follow with the hoe and cotton sweep. If at any place you fail of a stand transplant from where it is most abundant by means of small paddles or trowels just as in vegetable gardening. The transplanted rice will do equally as well as the other. Each one can tell for himself the order of plowing, hoeing, etc. The object is to use harrow, sweep and hoe absolutely sufficient to destroy the weeds and the grass. The rice will be of slow growth at first, but after a while will grow off rapidly and shade and kill out the grass. It is this rapid growth when started that enables you to lay it by with comparatively such little work.

5. *Manuring or fertilizing of rice.* Does it pay to manure or fertilize rice? I tried numbers of experiments to reach a proper solution of this question, in one year testing as many as seventeen different combinations of various fertilizers and manures. The conclusion reached was that with some lands it was hardly necessary, as they produced abundantly anyway. On other lands I found it paid well to fertilize. On some lands I used one year a heavy layer of horse-stable manure, and upon that I put a mixture of two hundred pounds of acid phosphate and one hundred pounds of kainit per acre, and bedded on it and planted. This gave very satisfactory net results. Horse-stable manure and cow-lot manure are very good for rice, but I would recommend in connection with them always the use of kainit or German potash salts to supply moisture and counteract the tendency to heat and dryness inhering in the manure. The simplest, cheapest and best manure, where one does not wish to be at much expense, is horse-stable or cow-lot manure deposited in drill in as large quantity as can well be supplied, and from one hundred to one hundred and fifty pounds of kainit per acre spread upon it, and then bed and plant. The combination of acid phosphate with kainit on horse-stable or cow-lot manure is very excellent and always gives satisfactory results. It will be necessary, however, for each one to try experiments with and without fertilizing and thus determine for himself the question whether the fertilizing of rice will pay on his lands.

6. *The cutting and handling.* Rice usually ripens and is harvested near Wilmington and Charleston at any rate by September. In this section it is not ripe enough to harvest until about the first or second week in October. It is

ripe enough to cut when the lowest grains in the head have passed through the milk state and are hard or hardening. It should not be cut too soon. If cut green it is hard to cure and liable to heat in the house or stack; the grain will be light and soft, break and waste in pounding, and make inferior grain for market. At the same time there will be greater difficulty in threshing and a considerable percentage left in the straw. On the other hand, if cutting be delayed too long and the grain allowed to get too ripe, the loss from shattering will be very great, and the straw will not be near so good for forage. The writer lost heavily on one of his crops by letting it stand too long. This led to its shattering very badly; and in removing the shocks to the thresher, the heads being heavy and the straw next to them brittle, a large proportion of the finest heads broke off and were left in the field. It seemed impossible to get the hands to gather them up and save them. Each one will have to use his own judgment in determining just when it is best to cut, bearing in mind what is indicated above, that rice is ripe enough to cut *when the lowest grains on the head, i. e., those nearest the stalk, have passed through the milk state and are hard or hardening.*

A good hand will cut from one to three acres a day, according to the rankness of the growth. Rice hooks, made especially for the purpose, may be bought at or ordered by hardware stores in Goldsboro, New Bern or Wilmington, and probably other places. It is customary near Charleston and Wilmington to lay the rice, as it is cut, loosely with heads on the stubble to cure for about twelve hours; then bundle and place in shocks. This will do if it does not rain. But if there should come heavy rains it will greatly discolor the grain by beating them into the dirt, and also injure the straw. I prefer to bundle and shock just as with wheat, and pursued this plan for a number of years without any detriment that I could discover. The great danger from this plan is that the rice may mow-burn, especially if cut green; but this may be obviated by taking the shocks apart whenever danger from heat is discovered; and after drying set them up again. It is of the greatest importance from the time of cutting that rice should be handled *gently* and *with great care.* There is no crop where greater loss is entailed by rough handling. The *gleaning,* too, is very important. The best rice (that is, the heaviest and ripest), will be left in the field, and great pains should be taken to secure good hands to glean your fields. A friend, of long experience in rice culture in the Cape Fear rice region, assures me that his gleanings amounted each year to three hundred bushels, and that the rice thus obtained was in great request at the mills and brought a higher price than any other kind.

7. *The threshing.* This is done in two ways, by hand and by machinery. It is desirable to handwhip rice for seed purposes. But this would be a very tedious way of getting out your whole crop if you planted any way extensively. However, I was informed by a gentleman in Goldsboro that he got out his whole crop in this way. He hired five hands, who averaged twenty bushels per day; and the cost, all told, was less than five cents per bushel. He sold his rice in Goldsboro at one dollar per bushel, sacks returned. It would be very expensive to buy regular rice threshers. The ordinary wheat thresher answers right well, but the cylinder has to be adjusted for the purpose. About thirty teeth were required to be taken out of the thresher with which I threshed my crop before it would pass the grain without breaking. I

found some difficulty in getting the grain clean from the straw. With particular care and skill in the adjustment of the wheat thresher it may be made to do the work very satisfactorily, and it, or a cheap modification of it, called a rice thresher, is generally relied on for threshing rice. After threshing, the rice may be cleaned with the ordinary grain fan, or this is sometimes done by pouring from a scaffold twenty feet high, which is said to be much the quickest and best plan when there is a pretty stiff breeze. I should, however, prefer the grain fan. The rice straw should be stacked as it comes from the thresher if it is dry. Have your poles all ready; select one or more of your best hands to do your stacking, and let the straw be carried to him; let him have a small sack of salt and now and then sprinkle a little salt on the straw as the stack is forming, and you will have an abundant supply of the very best forage for all your stock. The chaff may be placed in a pen in your lot under cover so that your cattle may feed on it during the winter.

8. *Placing it upon the market.* Rice sells by weight. Our State standard is fixed at forty-four pounds to the bushel. Generally forty-five pounds is required by those regularly in the market as buyers. It may be sold in the rough to the rice mills or to commission merchants or agents buying for them, or may be sold for seed. One bushel of rice in the rough, cleaned at first-class mills, if it be good and heavy, will usually produce about twenty-two pounds of clean rice, about one-half being taken up in the chaff and in the broken, inferior grades. It sells in the stores at from eight to ten cents per pound, but the producer would not be able to dispose of it so advantageously as those regularly engaged in buying and selling it. Farmers generally will do well to sell in the rough. There is more money in raising and preparing seed rice for the market than in any other way of disposing of it. If you have an article of pure white rice, well ripened, you are almost sure to realize for it from one dollar and twenty-five cents to two dollars per bushel, according to the tone of the market for clean rice, and the future prospects of the crop.

Having considered the requisites and methods of rice culture, let us present briefly in closing

SOME OF THE OBJECTIONS URGED AGAINST THE RAISING OF UPLAND RICE.

1. One of the greatest objections urged against the culture of upland rice is that it is a very exhaustive crop and *impoverishes the land.* To which we reply, first, that any crop that yields largely is necessarily exhausting from the very nature of the case. Just in proportion as the soil contains the constituent elements which make the stalk and grain, just in that proportion will the demand be for a supply of those elements. If the supply be small the crop will be small; if abundant, the result will be a large crop and a proportionately increased exhaustion. This is true of any crop. But of what use are our lands to us if they are not be subjected to this kind of exhaustion? Besides, there is a remedy for this in resting the land and in rotation of crops. Rotation with plowed crops performs a special service in clearing the land of "volunteer" (red) rice, which comes wherever rice is planted continuously. By resting the land and plowing under the stubble I am sure the recuperation will more than overbalance the exhaustion. All this proceeds upon the postulation that rice really does exhaust the land more than any other crop. But this is denied by many who are entitled to speak authoritatively on the sub-

ject. A high authority in South Carolina says: "I have very good rice on land which has been planted in it for three years; and on a neighboring place the seventh successive crop, in as many years, promises well; in each instance no manure has been used." A gentleman from below Wilmington assured me that he had seen the same land planted in rice for ten, twenty, thirty successive years without any apparent exhaustion or falling off in the crops. This, though, applied to lowlands. I should prefer to rest the land or rotate with plowed crops. As to manuring rice I am convinced that no crop would respond more liberally to heavy manuring. If the same pains were taken and the same quantity applied as in cotton the outcome would far exceed that of cotton. Manuring, then, in addition to rest and rotation, is an antidote to impoverishment of the land. It is a curious fact, reported from some of the eastern counties, that corn will not grow after rice. But rice will grow after rice and, if more profitable, why not grow it continuously? Those counties also report, I may say here, the existence of a disease known as rice or hemorrhagic fever as the result of rice-raising on large areas, and urge that as an objection, but of this I cannot speak, not being well informed about it.

2. A second objection is the *tediousness of the first working.* This is very trying, to be sure. It must, if necessary, be carefully hand-picked and, if possible, not a spire of grass left behind. This necessitates numerous and constant knee-bendings and develops temporary curvature of the spine, which isn't pleasant to those "who are exercised thereby." But with your crop thoroughly cleaned at the start you will have very little trouble with it afterwards. Besides, you remember Horace says: "Nothing (worth having) is accorded to mortals without great labor."

3. Another objection is the *great liability to loss* (greater than with any other crop) *in handling.* It is true that rice shatters badly and a considerable proportion of the largest and finest heads break off in the binding. But there is loss in connection with every crop the farmer makes, and the great remedy here is careful hands and careful handling.

4. The last objection I will notice is the *liability to failure from blast.* This is almost fatal as an argument against upland rice-raising. The experience which many have had on this score has led them to abandon the crop in whole or in part. Unless good seasons of rain are had from the latter part of August to the middle of September upland rice is almost sure to blast wholly or partially. Of course it may be urged that all other crops are as liable to failure as rice, and that the profits of a good rice crop are so great generally that the farmer can afford to lose every second or third crop and still make a good thing of it. And there is this compensation in rice that we do not have in cotton or scarcely any other crop, namely, that *its value as a forage crop alone is two or three times greater than the cost of making it.* Horses, mules and cattle can't live on cotton stalks, but they do live and thrive on rice forage. Still, where money is expected from the sale of the grain and the grain does not come, the money of course, will not come. The results are bound to be disappointing and, it may be, very embarrassing. My advice would be to not go into it too extensively at first, but to try it as an element of diversified farming. In the language of Davy Crockett: "Be sure you are right, and then go ahead."

In closing, permit me to quote the following words from my Rice Manual, written twelve years ago last January, from which you will perceive that, in the light of subsequent events, the spirit of prophecy seems to have seized me:

"You will remember that when Demosthenes was asked what was the first great element of power as an orator, he said 'Action'! 'And what the second?' '*Action*'! 'And what the third?' 'ACTION'!"

So if I were asked, "What, next to thorough cultivation, is the first great secret of successful farming?" I should say "Diversity of crops." "And what the second?" "*Diversity of crops.*" And what the third?" "DIVERSITY OF CROPS." We must diversify if we would succeed in farming. We are foredoomed if the present baneful practice of confining ourselves to one staple crop alone be continued. As it is, if the year be disastrous to cotton all is lost. If you have made cotton only it must go in the fall to pay your debts at whatever price the mighty combinations in New York, Liverpool and Manchester may be pleased to say you shall receive for it. But with a diversity of crops a season that may not suit cotton may be just the season for wheat, or for corn or rice or grass, etc. What I would say to every farmer, then, is this: "If you would succeed in farming, Diversify, *Diversify*, DIVERSIFY."

P. S.—Since enumerating the above objections to rice culture, another one presents itself of a formidable sort, namely, the recent formation, by the rice mills of the country, of a rice trust. This trust was practically formed several years ago, and as a result the price of rice tumbled from not less than one dollar to one dollar and thirty-five cents a bushel down to from sixty to eighty cents, seventy-five cents being about the best average. I sold one year my whole crop of over one thousand bushels at one dollar and thirty-four cents a bushel. Another crop I sold at a dollar and fifteen. The last crop I raised (the rice trust having then been formed) I sold at sixty-seven cents. Rice has not sold high since then, and the rice planters think they do well to get seventy-five cents a bushel, net, for their crops. Of course they will have to take what the rice trust may be pleased to pay them. But rice at seventy-five cents per bushel is a far more profitable crop than corn, which brings generally an average of only fifty cents per bushel, while the yield of rice on the same land is always much greater, and frequently doubles the yield of corn, the rice planter having thus a twofold advantage over the corn farmer in the larger yield and better price. The same contrast favorable to rice planting might also be made with other crops.

FOURTH (PARTIAL*) REPORT OF WORK ON THE DEPARTMENT'S TEST FARMS FOR SEASON 1903,

INCLUDING

VARIETY AND DISTANCE TESTS WITH CORN AND COTTON.

BY

B. W. KILGORE, STATE CHEMIST;

C. B. WILLIAMS, ASSISTANT CHEMIST,

AND

R. W. POU, SUPERINTENDENT EDGECOMBE TEST FARM;

J. L. McKINNON, SUPERINTENDENT RED SPRINGS TEST FARM;

G. T. BULLOCK, SUPERINTENDENT STATESVILLE TEST FARM.

On the following pages are recorded the results of this year's work with the variety and distance tests of corn and cotton on the Department's Test Farms. Two of these farms—Edgecombe and Red Springs—are located on the coastal plain formation, which comprises something like forty per cent of the total area of the State; the Edgecombe farm being of a fine sandy loam formation, underlaid by a rather tenacious sandy clay subsoil at a depth of from eight to twelve inches, while the Red Springs farm is of a coarse sandy soil with a sandy clay subsoil from twelve to fifteen inches below the surface. The Statesville farm consists of a deep red tenacious clay soil and subsoil, which is a type of soil covering a large area in the Piedmont section of the State. The testing of these two factors in the production of cotton and corn is of the most fundamental importance, as is evidenced by the difference in yield of different varieties and of different distancing when grown side by side in the same field, on the same type of soil, with identical cultivation and fertilization. Its importance is further emphasized when it is considered that 64.7 per cent (17.5 per cent to cotton and 47.2 per cent to corn) of the cultivated lands of North Carolina are devoted to these two crops with the small average annual yields of 215 pounds of lint cotton and 12.8 bushels shelled corn per acre. If by carefully conducted experiments through a number of years the most advantageous distancing and most prolific varieties of corn

* The main portion of the work for 1902 and 1903 is reserved for publication later in the year, when the results of the four years' tests will be brought together, with the view of drawing such conclusions as may be warranted on the subjects covered by the experiments.

and cotton on the different types of soil for an average season can be ascertained, and farmers generally be induced to use the best varieties and distances in growing these crops, material assistance will have been given in increasing the total amounts per acre of these crops grown in the State. Increasing the average yield of corn one bushel and seed cotton fifty pounds per acre will, according to the Census of 1900, increase the annual profits of the farmers of North Carolina by over $3,600,000, allowing sixty cents per bushel for corn and four cents per pound for seed cotton. This does not appear, with the hearty co-operation of farmers, such a far-distant possibility, in the light of results the past four years. Last year at the Edgecombe the difference between the highest and lowest yield of varieties of corn was fifteen bushels of shelled corn per acre, and of seed cotton over five hundred pounds on the same land, with identical cultivation and fertilization, while this year there was a difference of 12.8 bushels of shelled corn, and over six hundred and sixty pounds of seed cotton. It must not be forgotten that the best distancing of any crop is principally dependent upon soil fertility, while yield of a variety is governed largely by soil fertility and by the rigidity with which selection of seed of desirable characteristics has been made.

I. VARIETY AND DISTANCE TESTS OF CORN.

Preparation and Cultivation.—The plats were all broke alike with a two-horse turning plow eight to ten inches deep and harrowed. Soon after, the rows were run, 4 to 5 inches deep and 4 feet apart, in variety tests, and the several distances in the distance tests.

The fertilizer materials were applied uniformly in these drills and covered, the application being at the following rate per acre in all tests:

Three hundred pounds of a mixture of acid phosphate, cotton-seed meal and kainit, which contained 7 per cent available phosphoric acid, 1½ per cent potash and 3 per cent nitrogen, and cost $2.78.

The slight ridges formed in covering the fertilizer were opened and the corn planted a little below the level, all tests being given the same treatment as to time of planting and otherwise. All cultivations were level and rather deep early in the season, with the small hoes of the Planet Jr. Cultivator, but became shallower, using the large hoes as the season advanced and the roots extended towards the middle of the rows and nearer the surface. This afforded pretty thorough breaking of the land early in the season and prevented the disturbance of the root system later. An effort was made to cultivate every ten or twelve days, as far as the weather would permit, and especially immediately after rains, in order to produce a fine dust mulch with

the shallow-running plows, to retard the evaporation of the recently-added moisture.

This corn was harvested and shocked on August 23 at the Edgecombe farm, and September 7 and 17 at Statesville farm, but was not husked until November 12 at former and November 19 and 20 at the latter.

RESULTS OF VARIETY TEST OF CORN.

The results of this test are contained in the following tables:

TABLE I—RESULTS OF

EDGECOMBE

Rank in Order of Productivity.		Varieties Tested.	Number Stalks per Plot.		Date of Tasseling.	Average Height in Inches at Maturity.	Number Ears per Plot.	Average Number Ears per Stalk.
Shelled Corn.	Stover.		For Perfect Stand.	By Actual Count.				
1	1	Cocke's Prolific (Edgecombe Farm)						
2	3	Killebrew's*						
3	10	Biggs'						
4	22	Leaming						
5	16	Selection 77						
6	13	Hickory King						
7	4	Cocke's Prolific (Tennessee)						
8	14	Pool's						
9	19	Riley's Favorite						
10	11	Weekley's Improved						
11	17	Boone County—White (Indiana)						
12	21	Reid's Yellow Dent						
13	20	Boone County—White (Tennessee)						
13	6	Marlboro Prolific						
14	18	Iowa Silver Mine						
15	15	Number 167						
15	7	Holt's Strawberry						
16	5	Craig's Prolifiic—Strawberry						
17	9	Sanders' Improved						
18	8	Craig's Prolific—White						
19	2	Brake's						
20	12	Mosby's Prolific						

*This corn had the advantage of a bare row on one side of each of three rows in the test-plot until about June 1.

VARIETY TEST OF CORN.

FARM.

Yield per Plot.		Yield per Acre.				Shelling Capacity.		Total Weight.					
Ears—pounds.	Nubbins—pounds.	Ear Corn—pounds.	Shelled Corn—bushels.	Number Ears per Bushel—Shelled Corn.	Pounds Ears (Grain and Cob) for One Bushel Shelled Corn.	Grain—per cent.	Cob—per cent.	Ears—per cent.	Stover—per cent.	Stover per Acre—pounds.	Percentage Yield of Shelled Corn of Different Varieties—Calculated to Basis of Yield of Cocke's Prolific.	Percentage Yield of Stover of Different Varieties—Calculated to Basis of Yield of Holt's Strawberry.	Weight in Pounds of Measured Bushel—Shelled Corn.
140.50	22.25	1640.6	24.4	134	67.4	83.1	16.9	43.4	56.6	2139.6	100.0	114.6	57
127.50	22.00	1507.1	22.4	115	67.2	83.1	16.7	42.7	57.3	2021.1	91.8	108.2	----
99.50	42.25	1428.9	21.4	157	66.8	83.8	16.2	44.3	55.7	1796.9	87.7	96.2	----
115.50	25.00	1416.3	21.1	114	67.0	83.6	16.4	55.1	44.9	1154.3	86.5	61.8	----
118.50	16.00	1355.8	20.2	112	67.2	83.3	16.7	47.2	52.8	1517.2	82.8	81.2	----
109.00	18.50	1285.3	20.1	138	64.1	87.3	12.7	42.5	57.5	1738.9	82.4	93.1	----
113.00	21.50	1355.8	19.9	128	68.2	82.1	17.9	41.4	58.6	1920.4	81.5	102.9	----
97.00	29.50	1275.2	19.7	137	64.7	86.6	13.4	43.6	56.4	1648.2	80.7	88.3	57
112.00	16.50	1295.4	19.6	124	66.1	84.7	15.3	49.4	50.6	1325.6	80.3	71.0	----
95.75	32.50	1292.8	19.5	148	66.3	84.5	15.5	42.0	58.0	1781.8	79.9	95.4	56
107.00	22.50	1305.4	19.4	103	67.2	83.3	16.7	47.9	52.1	1416.4	79.5	75.8	----
95.00	19.50	1154.2	17.8	103	65.0	86.1	13.9	48.7	51.3	1214.7	73.0	65.0	----
104.00	17.00	1219.8	17.6	100	69.5	80.6	19.4	48.4	51.6	1300.4	72.1	69.6	----
87.50	29.50	1179.4	17.6	128	67.2	83.3	16.7	38.4	61.6	1895.2	72.1	101.5	56
91.50	22.25	1146.7	17.3	121	66.1	84.7	15.3	45.5	54.5	1373.5	70.9	73.5	54
84.00	25.50	1103.8	16.2	97	68.0	82.4	17.6	40.6	59.4	1618.0	66.4	86.6	----
77.25	27.50	1055.9	16.2	125	65.3	85.7	14.3	36.1	63.9	1867.5	66.4	100.0	55
72.00	28.00	1008.1	16.1	131	62.8	89.3	10.8	34.5	65.5	1915.3	66.0	102.6	58
77.00	20.00	977.8	15.3	133	64.0	87.5	12.5	34.6	65.4	1844.8	62.7	98.8	----
61.00	30.50	922.4	14.9	128	62.0	90.3	9.7	33.3	66.7	1849.8	61.1	99.1	----
56.00	33.50	902.2	13.7	110	66.0	84.9	15.1	30.3	69.7	2071.6	56.1	110.9	----
56.50	18.00	751.0	11.6	168	64.6	86.7	13.3	29.8	70.2	1769.2	47.5	94.7	----

TABLE I—RESULTS OF

STATESVILLE

Rank in Order of Productivity.		Varieties Tested.	Number Stalks per Plot.		Date of Tasseling:	Average Height in Inches at Maturity.	Number Ears per Plot.	Average Number Ears per Stalk.
Shelled Corn.	Stover.		For Perfect Stand.	By Actual Count.				
1	2	Biggs'	218	212	July 18--	82.4	331	1.56
2	15	Craig's Prolific—Strawberry	218	216	July 20--	86.4	199	.92
3	9	Marlboro Prolific	218	219	July 18--	80.8	271	1.24
4	4	Craig's Prolific—White	218	211	July 18--	84.2	212	1.00
5	7	Cocke's Prolific (Tennessee)	218	217	July 19--	90.8	213	.98
6	5	Weekley's Improved	218	224	July 25--	39.4	247	1.10
7	3	Mosby's Prolific	218	224	July 29--	86.4	218	.97
7	13	Boone County—White (Tennessee)	218	223	July 15--	82.4	190	.85
8	8	Holt's Strawberry	218	208	July 20--	92.4	177	.85
8	19	Riley's Favorite	218	213	July 13--	79.8	207	.97
9	6	Pool's	218	215	July 16--	86.4	227	1.06
10	11	Sanders' Improved	218	207	July 25--	87.6	215	1.04
11	14	Selection 77	218	204	July 14--	91.8	197	.97
12	1	Reid's Yellow Dent	218	210	July 13--	84.6	210	1.00
12	16	Leaming	218	215	July 13--	75.4	208	.97
13	12	Hickory King	218	192	July 15--	80.6	216	1.12
14	18	Iowa Silver Mine	218	198	July 13--	78.0	191	1.01
15	17	Boone County—White (Indiana)	218	219	July 14--	83.2	190	.87
16	10	Number 167	218	203	July 14--	92.2	167	.82

VARIETY TEST OF CORN—CONTINUED.

FARM.

Yield per Plot.		Yield per Acre.		Number Ears per Bushel—Shelled Corn.	Pounds Ears (Grain and Cob) for One Bushel Shelled Corn.	Shelling Capacity.		Total Weight.		Stover per Acre—pounds.	Percentage Yield of Shelled Corn of Different Varieties—Calculated to Basis of Yield of Biggs'.	Percentage Yield of Stover of Different Varieties—Calculated to Basis of Yield of Reid's Yellow Dent.	Weight in Pounds of Measured Bushel—Shelled Corn.
Ears—pounds.	Nubbins—pounds.	Ear Corn—pounds.	Shelled Corn—bushels.			Grain—per cent.	Cob—per cent.	Ears—per cent.	Stover—per cent.				
89.50	8.00	1950.0	29.7	142	65.6	85.4	14.6	45.3	54.7	2350.0	100.2	89.0	----
70.50	8.00	1570.0	24.7	105	63.5	88.2	11.8	50.6	49.4	1530.0	83.2	58.0	----
76.25	3.50	1595.0	24.3	131	65.7	85.3	14.7	46.8	53.2	1810.0	81.8	68.6	----
67.50	9.00	1530.0	23.9	115	64.0	87.5	12.5	41.6	58.4	2150.0	80.5	81.4	----
75.00	6.00	1620.0	23.5	138	68.9	81.3	18.7	45.0	55.0	1980.0	79.1	75.0	----
74.00	5.50	1590.0	23.3	140	68.1	82.2	17.8	43.0	57.0	2110.0	78.5	79.9	----
70.00	3.50	1470.0	22.6	133	65.1	86.0	14.0	39.6	60.4	2250.0	76.1	85.2	----
63.50	10.00	1470.0	22.6	116	63.7	86.1	13.9	47.4	52.6	1630.0	76.1	61.7	----
65.50	8.00	1470.0	21.9	90	67.2	83.3	16.7	43.2	56.8	1930.0	73.7	73.1	----
61.00	11.50	1450.0	21.9	110	66.1	84.7	15.3	55.8	44.2	1150.0	73.7	43.6	----
66.50	6.00	1450.0	21.8	150	66.7	84.1	15.9	42.2	57.8	1990.0	73.4	75.4	----
71.00	1.00	1440.0	21.7	116	66.4	84.4	15.6	46.5	53.5	1660.0	73.1	62.9	----
65.00	5.00	1400.0	21.2	115	66.0	84.9	15.1	46.7	53.3	1600.0	71.4	60.6	----
56.50	11.50	1360.0	20.8	108	65.4	85.6	14.4	33.8	66.2	2640.0	70.0	100.0	----
58.00	10.00	1360.0	20.8	131	65.3	85.7	14.3	47.9	52.1	1480.0	70.0	56.1	----
64.00	3.50	1350.0	20.7	125	65.3	85.8	14.2	45.0	55.0	1650.0	69.7	62.5	----
58.50	10.00	1370.0	20.6	103	66.6	84.1	15.9	51.1	48.9	1310.0	69.4	49.6	----
60.00	8.00	1360.0	19.9	97	68.2	82.1	17.9	48.6	51.4	1440.0	67.0	54.5	----
48.00	11.00	1180.0	17.1	95	68.9	81.3	18.7	40.7	59.3	1720.0	57.6	65.2	----

TABLE II—COMPILED RESULTS OF VARIETY TESTS OF CORN.

EDGECOMBE FARM.

Varieties Tested.	1900.		1901.		1902.		1903.		Averages.	
	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity.
Cocke's Prolific (Edgecombe Farm)	20.0	2	28.1	2	35.2	1	24.4	1	26.9	1
Cocke's Prolific (Tennessee)							19.9	7		
Weekley's Improved	19.4	3	29.5	1	33.5	2	19.5	10	25.5	2
Pool's					26.1	5	19.7	8		
Craig's Prolific—Strawberry					29.1	3	16.1	16		
Sanders' Improved	17.8	4	27.0	3	27.1	4	15.3	17	21.8	4
Holt's Strawberry	22.4	1	25.7	6	24.9	6	16.2	15	22.3	3
Craig's Prolific—White					24.6	7	14.9	18		
Champion White Pearl					21.6	8				
Cooley's Red Cob	17.2	6			20.6	10				
Improved Golden Dent			22.5	7						
Champion Dent			22.2	8						
Hickory King			21.4	9			20.1	6		
Mosby's Prolific	17.4	5								
Tatum's Choice	17.0	7								
Shaw's Improved	16.2	8								
Tennessee Yellow			26.6	5						
Killebrew's (Native)			26.9	4	21.4	9	22.4	2		
Leaming					20.0	12	21.1	4		
Brake's					20.5	11	13.7	19		
Marlboro Prolific							17.6	13		
Biggs'							21.4	3		
Iowa Silver Mine							17.3	14		
Reid's Yellow Dent							17.8	12		
Riley's Favorite							19.6	9		
Boone County—White (Indiana)							19.4	11		
Boone County—White (Tennessee)							17.6	13		
Number 167							16.2	15		
Selection 77							20.2	5		

TABLE II—COMPILED RESULTS OF VARIETY TESTS OF CORN—CONTINUED.

RED SPRINGS FARM.

Varieties Tested.	1900.		1901.		1902.		1903.		Averages.	
	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity.
Native	22.4	1	14.1	4						
Coman's Best	16.6	2								
Mosby's Prolific	15.4	3								
Bradbury's Improved	15.0	4								
Cocke's Prolific	14.4	5	15.3	3						
Blount's Prolific	10.2	6								
Improved Golden Dent	10.0	7	14.1	5						
Clarke's Mastodon	9.0	8								
Holt's Strawberry	8.4	9	17.3	2						
Weekley's Improved			19.0	1						
Sanders' Improved			14.0	6						
Tennessee Yellow			13.5	7						
Hickory King			12.4	8						
Champion Dent			11.3	9						

COMMENTS ON VARIETY TESTS OF CORN.

The variety tests of corn were conducted this year only at the Edgecombe and Statesville farms, as sufficient desirable space was not available at the Red Springs farm. The land at the Edgecombe farm devoted to this test was a fine sandy loam, underlaid at a depth of from eight to twelve inches by a moderately stiff yellow sandy clay subsoil, while at Statesville the soil was a fine sandy brownish clay soil with a stiff red clay subsoil. The land at both places was tolerably level and uniform in character, and the stand of all varieties at Edgecombe was so near perfect that a count was not made of the number of stalks of the different varieties to the plat. To eliminate all inequalities in the character of the land, if any, the designated varieties at the different farms were planted each in separate rows, arranged consecutively, and this plan was repeated from three to five times, varying with the length of the rows, in order to give the desired acreage to each variety. The varieties are arranged in Table I in the order of their productivity of shelled corn per acre; also the rank in yield of stover per acre is indicated in the second column. In Table II are brought together the results of varietal tests obtained at the Edgecombe farm during 1900, 1901, 1902 and 1903, and at Red Springs during 1900 and 1901.

SOME NOTES ON VARIETIES OF CORN TESTED IN 1903.

Cocke's Prolific, from home-grown seed, ranked second in 1900 and 1901, and first in 1902 and 1903, in bushels of shelled corn per acre at the Edgecombe farm, while at Red Springs it stood fifth in 1900 and third in 1901. On the Statesville farm in 1903, with Tennessee-grown seed, the yield of this variety in shelled corn per acre stood fifth in comparison with eighteen other varieties. The results of comparative varietal tests conducted during the past four years on the test farms indicate this to be a most substantial and reliable variety; in fact, the best variety thus far tested for growth on the sandy loam soils of the eastern portion of the State. One defect with this variety is that the grains are too short.

Weekley's Improved is a very good variety, having ranked second at the Edgecombe farm as an average of four years' trial. It is tolerably early in maturity and can be grown with more safety than most of the other varieties when only a short growing period is afforded. At the Edgecombe farm it ranked in 1900 third, in 1901 first, in 1902 a close second, but in 1903 fell down to tenth place. In 1901 at Red Springs and 1903 at Statesville it stood first and sixth respectively. It has a little smaller ear and cob than *Cocke's Prolific*

Craig's Prolific-Strawberry stood third in 1902 and sixteenth in 1903 at the Edgecombe farm, and second in 1903 at Statesville, in the only tests in which it has been included. It has a small cob that does not hold the grains very well. This is a promising variety.

Craig's Prolific-White ranked seventh in 1902 and eighteenth in 1903 at the Edgecombe farm, while at the Statesville farm in 1903 it occupied fourth place. This and *Craig's Prolific-Strawberry* have the smallest proportion of cobs to grain of any varieties thus far tested. The serious drawbacks to this variety are the chaffy appearance of the grains and the ease with which they are shattered off the cob. *Craig's Prolific-Strawberry* and *Craig's Prolific-White* both generally have deep, well-shaped grains and fill the area on the cob very compactly. It yields only about 60 to 70 per cent as much shelled corn as *Cocke's Prolific.*

Sanders' Improved, from Georgia-grown seed, ranked fourth in 1900, third in 1901, fourth in 1902 and seventeenth in 1903 at the Edgecombe farm, sixth in 1901 at Red Springs and tenth in 1903 at Statesville. This variety produces an ear about the size of Cocke's Prolific, but contains a smaller cob by about four per cent, and consequently requires about three pounds less of corn-on-the-ear, as shown by an average of the results of the past three years, to shell a bushel of corn.

Pool's took fifth place in 1902 and eighth in 1903 at the Edgecombe farm, while at Statesville in 1903 it stood ninth. When grown in the eastern part of the State it produces an ear about the size of *Craig's Prolific-Strawberry*, but generally has a much larger cob and produces less stover per acre.

Holt's Strawberry occupied first place in 1900, sixth in 1901, sixth in 1902 and fifteenth in 1903 at the Edgecombe farm, ninth in 1900 and second in 1901 at Red Springs, and eighth in 1901 at Statesville. It has a much larger ear than Cocke's Prolific and produces a larger percentage of stover than most other varieties tested.

Killebrew's (native) ranked fourth in 1901, ninth in 1902 and second* in 1903 at the Edgecombe farm. Tliis has a larger ear than *Cocke's Prolific.*

* This corn had the advantage of a bare row on one side of each of three rows until about the first of June.

Native (Robeson County) stood first in 1900 and fourth in 1901 at the Red Springs farm.

Brake's, as a result of two years' test at Edgecombe, the home of the variety, ranked eleventh in 1902 and nineteenth in 1903. It has an ear about the size of *Killebrew's* corn, but of a different shape.

Leaming ranked twelfth in 1902 and fourth in 1903 at the Edgecombe farm, and twelfth in 1903 at Statesville. This is a yellow corn that has a strong tendency to produce only one large ear per stalk. It has yielded excellent results in Indiana, Iowa and Illinois in comparison with other varieties.

Biggs' stood third at the Edgecombe farm and first at Statesville in 1903. This year's results indicate this variety to be a very promising one. It, like *Cocke's Prolific* (Edgecombe-grown), has a strong tendency to produce two or more ears to each stalk. It has a little smaller ear than *Cocke's Prolific*, but about the same shelling capacity.

Selection 77, from Ohio-grown seed, ranked fifth at Edgecombe and eleventh at Statesville in 1903. This corn has a larger ear than *Cocke's Prolific*, but has about the same shelling capacity.

Hickory King, from Tennessee-grown seed, occupied ninth place in 1901 and sixth in 1903 at the Edgecombe farm, eighth in 1901 at Red Springs, and thirteenth in 1903 at Statesville. Although this variety has a strongly inbred tendency to produce two or more ears to each stalk, it has never given us a very high yield.

Riley's Favorite, from Indiana-grown seed, ranked ninth at the Edgecombe farm and eighth at Statesville in 1903. This is a yellow corn with tolerably small and narrow grains. It has a somewhat larger ear than *Cocke's Prolific* and requires about one pound less of ear-corn to shell a bushel of grain.

Boone County White, from Indiana-grown seed, stood in 1903 eleventh at Edgecombe and fifteenth at Statesville, while from Tennessee-grown seed it ranked thirteenth at Edgecombe and seventh at Statesville during the same year. This is a large white-eared variety.

Reid's Yellow Dent, from Illinois seed, ranked twelfth at both the Edgecombe and Statesville farms in 1903. This is a yellow corn that has a tendency to produce one large ear per stalk.

Marlboro Prolific, in 1903, at the Edgecombe and Statesville farms, ranked thirteenth and third respectively. This variety has an ear about the size of *Cocke's Prolific* and has a decided, strong tendency to bear more than one ear to each stalk.

Iowa Silver Mine, from Illinois-grown seed, ranked fourteenth at both the Edgecombe and Statesville farms in 1903. This is a white large-eared corn that has a slightly smaller proportion of cob to grain than *Cocke's Prolific*. Its grains are well shaped, showing the effect of prolonged intelligent breeding.

Number 167, from Pennsylvania seed, stood in 1903 fifteenth at Edgecombe and sixteenth at Statesville. This is a large yellow-eared variety that contained a considerable number of barren stalks, as the average number of ears per stalk was only .82 at Statesville, where a record was kept this year.

Mosby's Prolific, Mississippi-grown seed, ranked fifth in 1900 and twentieth in 1903 at the Edgecombe farm, third in 1900 at Red Springs, and seventh in 1903 at Statesville. At Statesville, where this variety did best during 1903, it produced a little less than one ear per stalk. It has a very large proportion of stalk to ear.

SELECTING SEED FOR IMPROVEMENT.

In the improvement of corn by seed selection we should endeavor to start with the best variety as ascertained by actual tests in the field through a sufficient number of years to eliminate weather conditions. It must be borne in mind that in all plant improvement the same principles and practices that have been employed with such striking results in the improvement of the different breeds of animals must be followed.

For corn there are three general methods of improvement: First, by importation of seed from some reputable breeder or grower; second, by the careful selection of seed corn from one's own field or from a neighbor's; third, by careful selection and growing of seed corn in a field isolated something like four or five hundred yards from any other cornfield.

The characters that should be taken into account in the improvement of corn by selection are:

(1). Selection of ears from stalks bearing two or more ears, as it has been demonstrated time and again that a variety that bears two medium-sized ears per stalk will generally give higher yields of shelled corn per acre than a variety bearing one large ear to the stalk.

(2). The stalk should be large at the base and tapering gradually towards the tassel, for two reasons: First, because it will be better enabled to withstand drought, and second, because it will stand up better in windstorms.

(3). The ears should by all means be of a cylindrical form, with both butts and tips filled out, as this is the form that gives the highest percentage yield of shelled corn per acre, other things being equal.

(4). The best-shaped kernel is a medium wedge, as this fills out the space on the cob most completely. Also the distance between the rows of grains should be small, while the number of rows should be large and run parallel the full length of the cob, with little or no diminution in size either at the butts or tips. The grains should be held rigidly by the cob and should possess a high—90 to 95 per cent—germinating power and great resisting power to disease and insect ravages.

It should be kept clearly in mind that with varieties of corn, selection should be made particularly with reference to total yield of shelled corn and the purposes for which the grain is grown. If it is to be used in feeding growing animals, or to be ground into meal for human consumption, it should be high in flesh and muscle-forming material (protein); if for fattening stock, high in fat; and if to manufacture whiskey, alcohol or starch, high in starch, sugar, etc. (carbohydrates).

SOURCES OF VARIETIES TESTED IN 1903.

The varieties of corn grown in the preceding tests at the Edgecombe and Statesville farms were obtained from the following sources:

Cocke's Prolific.....Edgecombe Test Farm, Rocky Mount, N. C.
Weekley's Improved.....J. F. Weekley, Ulmers, S. C.
Craig's Prolific-Strawberry.....W. R. Craig, Waxhaw, N. C.
Craig's Prolific-White.....W. R. Craig, Waxhaw, N. C.
Sanders' Improved.....Bureau Plant Industry, Washington, D. C.
Iowa Silver Mine.....Bureau Plant Industry, Washington, D. C.
Leaming.....Bureau Plant Industry, Washington, D. C.
Reid's Yellow Dent.....Bureau Plant Industry, Washington, D. C.

Riley's Favorite.....Bureau Plant Industry, Washington, D. C.
Boone County White.....Bureau Plant Industry, Washington, D. C.
Number 167.....Bureau Plant Industry, Washington, D. C.
Hickory King.....Bureau Plant Industry, Washington, D. C.
Selection 77.....Bureau Plant Industry, Washington, D. C.
Mosby's Prolific.....Bureau Plant Industry, Washington, D. C.
Holt's Strawberry.....T. W. Wood & Sons, Richmond, Va.
Pool's.....J. L. Pool, Marion, N. C.
Marlboro Prolific.....C. F. Moore, Bennettsville, S. C.
Killebrew's.....N. B. Killebrew, Rocky Mount, N. C.
Biggs'.....Noah Biggs, Scotland Neck, N. C.
Brake's.....J. L. Brake, Rocky Mount, N. C.

DISTANCE TESTS OF CORN.

The results of the distance tests of corn are included in Tables III and IV, which follow:

TABLE III—RESULTS OF DISTANCE TESTS OF CORN.

EDGECOMBE FARM.

Size of Plots in Parts of Acre.	Distance Between Rows.	Distance Between Stalks in Rows.	Number Stalks per Plot.		Number Ears per Plot.	Average Height of Stalks in Inches at Maturity.	Yield per Acre in Pounds.				Total Bushels Shelled Corn per Acre.	Pounds Shelled Corn per Stalk.
			For Perfect Stand.	By Actual Count.			Ears.	Nubbins.	Total Corn on Cob.	Stover.		
.0942	Three and one-half feet.	Two feet	----	----	----	----	1502.1	326.4	1828.5	2523.9	22.0	----
.0942	Three and one-half feet.	Three and one-half feet.	----	----	----	----	1496.8	95.5	1592.3	2229.3	26.8	----
.0942	Three and one-half feet.	Four feet	----	----	----	----	1496.8	193.7	1690.5	1971.9	23.7	----
.1076	Four feet	Two and one-half feet.	----	---	----	----	1877.3	213.8	2091.1	2277.0	27.4	----
.1076	Four feet	Three feet	----	----	----	----	1477.7	92.9	1570.6	1914.5	23.0	----
.1076	Four feet	Four feet	----	----	----	----	1693.8	195.2	1889.0	2107.3	25.4	----
.1345	Five feet	Two feet	----	----	----	----	1275.1	213.8	1488.9	2042.8	24.6	----
.1345	Five feet	Three feet	----	----	----	----	1174.7	145.0	1319.7	1617.1	19.5	----
.1345	Five feet	Four feet	----	----	----	----	1273.2	145.0	1418.2	1555.8	18.7	----

RED SPRINGS FARM.

.1069	Three and one-half feet.	Three and one-half feet.	380	370	----	----	851.3	346.1	1197.4	1216.1	17.8	.29
.1221	Four feet	Two feet	665	652	----	----	819.0	417.7	1236.7	1310.4	18.3	.19
.1221	Four feet	Three feet	443	428	----	----	835.4	278.5	1113.9	1048.3	16.5	.26
.1221	Four feet	Four feet	333	326	----	----	1023.8	204.8	1228.6	900.9	18.2	.38
.1527	Five feet	Two feet	665	650	----	----	799.0	386.4	1185.4	1113.3	17.6	.23
.1527	Five feet	Three feet	443	430	----	----	943.0	353.6	1296.6	916.8	19.2	.38
.1527	Five feet	Four feet	333	325	----	----	779.3	189.9	969.2	785.9	14.4	.38

TABLE III—RESULTS OF DISTANCE TESTS OF CORN—CONTINUED.

STATESVILLE FARM.

Size of Plots in Parts of Acre.	Distance Between Rows.	Distance Between Stalks in Rows.	Number Stalks per Plot.		Number Ears per Plot.	Average Height of Stalks in Inches at Maturity.	Yield per Acre in Pounds.				Total Bushels Shelled Corn per Acre.	Pounds Shelled Corn per Stalk.
			For Perfect Stand.	By Actual Count.			Ears.	Nubbins.	Total Corn on Cob.	Stover.		
.0482	Three and one-half feet.	Four feet	150	152	180	106	1161.8	62.2	1224.0	1473.0	18.0	.39
.0482	Three and one-half feet.	Three feet	200	187	194	109	1338.2	150.4	1488.6	1519.7	21.9	.38
.0482	Three and one-half feet.	Two feet	300	248	200	90	933.6	145.2	1078.8	1825.7	15.8	.21
.0551	Four feet	Four feet	150	144	198	108	1011.8	36.3	1048.1	1315.7	15.4	.40
.0551	Four feet	Three feet	200	194	191	102	1098.0	63.5	1161.5	1379.3	17.1	.33
.0551	Four feet	Two and one-half feet.	240	211	227	96	1043.6	72.6	1116.2	1333.9	16.4	.29
.0551	Four feet	Two feet	300	225	238	96	916.5	72.6	989.1	1642.5	14.5	.24
.0551	Four feet	One and one-half feet.	400	303	288	120	1483.7	72.6	1556.3	2164.2	22.9	.28
.0689	Five feet	Four feet	150	147	228	100	1313.5	36.3	1349.8	1132.1	19.8	.63
.0689	Five feet	Three feet	200	215	274	106	1306.2	87.1	1393.3	1436.9	20.5	.45
.0689	Five feet	Two feet	300	219	284	96	1248.2	101.6	1349.8	1553.0	19.8	.43

TABLE IV—COMPILED RESULTS OF DISTANCE TESTS OF CORN.

EDGECOMBE FARM.

Year.	Yield of Shelled Corn in Bushels per Acre at Different Distancing.												
	3½ feet by 2 feet.	3½ feet by 3 feet.	3½ feet by 3½ feet.	3½ feet by 4 feet.	4 feet by 1½ feet.	4 feet by 2 feet.	4 feet by 2½ feet.	4 feet by 3 feet.	4 feet by 3½ feet.	4 feet by 4 feet.	5 feet by 2 feet.	5 feet by 3 feet.	5 feet by 4 feet.
1901	------	------	------	------	------	28.6	------	28.4	------	24.4	22.5	24.3	23.0
1902	------	18.8	16.1	14.6	------	------	17.6	16.1	------	16.2	------	13.0	13.6
1903	22.0	------	26.8	23.7	------	------	27.4	23.0	------	25.4	24.6	19.5	18.7

RED SPRINGS FARM.

1901	------	------	9.2	------	------	10.0	------	10.7	------	16.2	20.0	17.9	18.3
1902	------	------	14.8	------	------	11.9	------	14.4	------	11.4	12.2	11.3	10.9
1903	------	------	17.8	------	------	18.3	------	16.5	------	18.2	17.6	19.2	14.4

STATESVILLE FARM.

1903	15.8	21.9	------	18.0	22.9	14.5	16.4	17.1	------	15.4	19.8	20.5	19.8

COMMENTS ON DISTANCE TESTS.

These tests were conducted at all three of the Department farms, using *Cocke's Prolific* at the Edgecombe and Red Springs farms and *Weekley's Improved* at Statesville. The distancing that produced the best results this year at the Edgecombe farm was 3½ by 3½ and 4 by 2½ feet; at Red Springs it was 5 by 3 feet and 4 by 2 feet, while at Statesville it was 3½ by 3 feet and 4 by 1½ feet. It will require a number of repetitions of this test to arrive at a fair idea of the best width of rows and distance in rows for planting corn on the types of soil used in the experiments. This will no doubt vary with the different kinds of corn, soil and season. The stand was so near perfect at the Edgecombe farm this year that a count of the number of stalks per plat was not made.

In Table IV is presented in concise form the results of distance tests with corn at the Edgecombe and Red Springs farms during the past three years, and at Statesville during the past year.

II. VARIETY AND DISTANCE TESTS OF COTTON.

Preparation and Cultivation.—All plats were broke the first of March at Red Springs, middle of March at Edgecombe, and the last week in March at Statesville, seven to ten inches deep, with a two-horse turning plow, and harrowed smooth a few days later. From the middle to the last of April rows were run, five to seven inches deep, with 8-inch shovel, and the fertilizer materials applied in the drill at the following rate per acre in all tests:

Four hundred pounds per acre of a mixture of acid phosphate, cottonseed meal and kainit,* which contained 7 per cent available phosphoric acid, 2½ per cent potash and 2½ per cent nitrogen, and cost $3.63.

The cultivation was level with cultivators, being moderately deep at the beginning of the season and shallower as the root zone increased. The cultivator was never run more than twice to the row at a time, as this more than covered the middle, and an effort was made to work over the plats as quickly as possible immediately after rains to break the crust formed by the showers and leave a dust mulch to check evaporation. The cultivator was run about 1½ to 2 inches deep toward the close of the season. It was attempted to cultivate every ten days, which had to be changed, of course, to suit the season.

The past season was generally a rather trying one on cotton in this State, as it was so dry at planting time that most of the seed remained in the ground weeks before germination; and further, frost came unusually early and cut off the yield, especially from the large-boll varieties on moderately moist land, as they did not have a sufficiently long growing period to mature all their bolls.

RESULTS OF VARIETY TESTS OF COTTON.

The results of these tests are included in the following tables:

* At the Statesville farm the potash was derived from muriate of potash instead of kainit.

TABLE V—RESULTS OF

EDGECOMBE

Size of Plots in Parts of Acre.	Varieties Tested.	Number of Stalks per Plot. For Perfect Stand.	Number of Stalks per Plot. By Actual Count.	Average Height of Stalks in Inches at Maturity.	Yield Seed Cotton in Pounds per Plot at the Several Pickings. First Picking November 23-25.	Second Picking	Third Picking.	Total Pickings.
.0167	Edgewood	140	143	30	28.25			28.25
.0333	Excelsior Prolific	280	288	40	54.00			54.00
.0333	King's Improved	280	285	29	46.00			46.00
.0333	Daughtridge	280	294	38	44.50			44.50
.0167	Garrard's Improved Prolific	140	135	35	22.25			22.25
.0333	Peterkin's Improved	280	276	40	43.00			43.00
.0333	Russell's Big Boll	280	296	36	39.75			39.75
.0333	Truitt's Improved	280	*158	42	34.50			34.50
.0333	Culpepper's Improved	280	260	30	34.25			34.25

RED SPRINGS

					Sept. 29.	Oct. 19.	Dec. 16.	
.1070	Excelsior Prolific	999	950	26	37.00	44.00	20.00	101.00
.1070	Edgewood	999	980	27	37.00	44.00	18.00	99.00
.1070	Culpepper's Improved (Red Springs)	999	970	26	40.00	35.00	23.00	98.00
.1070	Peterkin's Improved	999	990	24	34.00	43.00	21.00	98.00
.1070	Culpepper's Improved (Edgecombe)	999	995	26	35.00	40.00	21.00	96.00
.1070	Russell's Big Boll	999	985	22	35.00	40.00	20.00	95.00
.1070	King's Improved	999	992	18	53.00	24.00	10.00	87.00
.1070	Truitt's Improved	999	*500	24	12.00	20.00	12.00	44.00

STATESVILLE

					Oct. 19.	Nov. 23.	Dec. 30.	
.0500	King's Improved (Native)	523	482	20	22.00	10.25	5.25	37.50
.0500	King's Improved	523	494	24	15.00	12.50	5.25	32.75
.0500	Russell's Big Boll	523	407	27	4.50	19.50	8.00	32.00
.0500	Culpepper's Improved	523	482	30	8.50	15.00	8.00	31.50
.0500	Edgewood	523	467	30	8.75	12.00	9.50	30.25
.0500	Excelsior Prolific	523	479	36	9.00	8.75	6.00	23.75
.0500	Garrard's Improved Prolific	523	448	33	9.25	7.00	4.25	20.50
.0500	Truitt's Improved	523	425	24	5.50	7.00	5.50	18.00
.0500	Peterkin's Improved	523	457	36	2.75	6.75	5.00	14.50

*This very poor stand of Truitt's Improved was due to inferior seed.

VARIETY TESTS OF COTTON.

FARM.

Total Pounds Seed Cotton per Acre.	Number Bolls Required to Yield One Pound of Seed Cotton.	Number Seed in One Pound Seed Cotton.	Pounds of Lint in 100 Pounds of Seed Cotton.	Pounds of Seed in 100 Pounds of Seed Cotton.	Pounds of Lint per Acre.	Pounds of Seed per Acre.	Value of Lint per Acre at 13 Cents per Pound.	Value of Seed per Acre at 80 Cents per 100 Pounds or 24 Cents per Bushel.	Total Value of Lint and Seed per Acre.
1691.60	75.5	2,882	35.37	64.63	598.32	1093.28	$ 77.78	$8.75	$86.53
1621.60	95.5	3,463	36.56	63.44	592.86	1028.74	77.07	8.23	85.30
1381.40	102.6	3,230	39.20	60.80	541.51	839.89	70.40	6.72	77.12
1336.30	93.7	3,415	36.48	63.52	487.48	848.82	63.37	6.79	70.16
1332.30	101.9	3,208	38.40	61.60	511.60	820.70	66.51	6.57	73.08
1291.30	92.2	3,237	40.94	59.06	528.66	762.64	68.73	6.10	74.83
1193.70	58.3	2,076	34.30	65.70	409.44	784.26	53.23	6.27	59.50
1036.00	74.6	2,313	36.63	63.37	379.49	685.61	49.33	5.48	54.81
1028.50	68.9	2,431	35.83	64.17	368.51	659.99	47.91	5.28	53.19

FARM.

943.90	120	----------	40.62	59.38	383.41	560.49	$ 49.84	$4.48	$54.32
925.20	75	----------	35.94	64.06	332.52	592.68	43.23	4.74	47.97
915.90	70	----------	37.50	62.50	343.46	572.44	44.65	4.58	49.23
915.90	100	----------	39.06	60.94	357.75	558.15	46.51	4.47	50.98
897.20	68	----------	37.50	62.50	336.45	560.75	43.74	4.49	48.23
887.90	60	----------	32.81	67.19	291.32	596.58	37.87	4.77	42.64
813.10	115	----------	40.62	59.38	330.28	482.82	42.94	3.86	46.80
411.20	75	----------	35.94	64.06	147.78	263.42	19.21	2.11	21.32

FARM.

750.00	104	2,838	36.22	63.78	271.65	478.35	$ 35.31	$3.83	$39.14
655.00	108	3,231	37.84	62.16	247.85	407.15	32.22	3.26	35.48
640.00	79	2,289	35.05	64.95	224.32	415.68	29.16	3.33	32.49
630.00	81	2,535	34.45	65.55	217.04	412.96	28.22	3.30	31.52
605.00	87	2,701	36.58	63.42	221.31	383.69	28.77	3.07	31.84
475.00	99	3,100	35.45	64.55	168.39	306.61	21.89	2.45	24.34
410.00	106	3,152	38.57	61.43	158.14	251.86	20.56	2.01	22.57
360.00	86	2,617	34.94	65.06	125.78	234.22	16.35	1.87	18.22
290.00	101	3,364	39.65	60.35	114.99	175.01	18.85	1.40	20.25

TABLE VI—COMPILED RESULTS OF VARIETY TESTS OF COTTON.

EDGECOMBE FARM.

Varieties Tested.	1900.		1901.		1902.		1903.	
	Yield in Pounds Seed Cotton per Acre.	Rank in Productivity.	Yield in Pounds Seed Cotton per Acre.	Rank in Productivity.	Yield in Pounds Seed Cotton per Acre.	Rank in Productivity.	Yield in Pounds Seed Cotton per Acre.	Rank in Productivity.
Russell's Big Boll	1265.0	2	1487.0	1	1675.0	1	1193.7	7
Culpepper's Improved	1125.6	4	1302.0	2	1230.0	4	1028.5	8
Moss' Improved	1305.0	1	999.0	6				
Breeden's Prolific	1205.0	3						
Todd's Improved	1000.0	5						
Strickland's Improved	950.0	6	1142.0	4				
Lewis' Prize	770.0	7						
Hawkins' Prolific	740.0	8	1053.0	5				
Peterkin's Improved			1215.0	3	1372.5	2	1291.3	6
Griffin's Improved			957.0	7				
Truitt's Improved					1335.0	3	1036.0	
Daughtridge's					1230.0	4	1336.3	4
Blue Ribbon					1170.0	5		
King's Improved					885.0*		1381.4	3
Excelsior Prolific							1621.6	2
Edgewood							1691.6	1
Garrard's Improved Prolific							1332.3	5

*This yield of King's Improved should not be included in the comparisons, as the stand was so very poor.

TABLE VI—COMPILED RESULTS OF VARIETY TESTS OF COTTON—CONTINUED.

RED SPRINGS FARM.

Varieties Tested.	1900.		1901.		1902.		1903.	
	Yield in Pounds Seed Cotton per Acre.	Rank in Productivity.	Yield in Pounds Seed Cotton per Acre.	Rank in Productivity.	Yield in Pounds Seed Cotton per Acre.	Rank in Productivity.	Yield in Pounds Seed Cotton per Acre.	Rank in Productivity.
Russell's Big Boll	675.0	2	496.3	1	1070.0	2	887.9	5
Culpepper's Improved (Edgecombe)	734.4	1	477.0	2	1218.5	1	897.2	4
Culpepper's Improved (Red Springs)							915.9	3
Peterkin's Improved	660.0	3	440.0	5	982.5	3	915.9	3
Doughty's Excelsior	655.0	4						
Allen's Long Staple	635.0	5						
Moore's Excelsior	635.0	5						
Texas Burr	630.0	6						
Groveton	605.0	7						
Native	530.0	8						
Griffin's Improved			473.1	3				
Hawkins' Prolific			448.3	4				
Moss' Improved			417.0	6				
Sea Island			255.0	7				
King's Improved					910.0	4	813.1	6
Excelsior Prolific					895.0	5	943.9	1
Truitt's Improved							411.2*	
Edgewood							925.2	2

*This yield of Truitt's Improved should not be included in the comparisons, as the stand was so very poor.

COMMENTS ON VARIETY TESTS OF COTTON.

The varieties tested at each farm are arranged in the order of their productivity of seed cotton, but which may not be the order of the selling price of total products (lint and seed), as is well shown by *Peterkin's Improved* at both the Edgecombe and Red Springs farms. At the former it stands sixth in seed-cotton production and fourth in value, while at the latter it ranks fourth in seed cotton and second in value of total products, due to the high percentage yield of lint of this variety. The sizes of the plats used for this test at the Edgecombe, Red Springs and Statesville farms were one-thirtieth (except two, which were one-sixtieth), a little over one-tenth and one-twentieth acre respectively. To eliminate inequalities in the land, if any, the different varieties at the separate farms were planted each in separate rows arranged consecutively, and this plan repeated a sufficient number of times to give the designated acreage. The rows were 3½ feet apart at Edgecombe and Red Springs farms and 3⅓ feet at Statesville, while the hills in the row were 15 inches at Edgecombe and Statesville and 16 inches at Red Springs.

It might be stated here that the small yield of *Truitt's Improved* at the Edgecombe and Red Springs farms was due to an exceedingly poor stand, which, in turn, was due to the low vitality of seed planted, as the soil, preparation and cultivation were identical for all varieties. It is absolutely essential, in order to eliminate soil and weather conditions as much as possible, to continue work of this kind for some years on different types of soils before attempting to draw definite conclusions.

The yields for this year are in Table V, while a resume of the results obtained during the past four years at the Edgecombe and Red Springs farms is presented in Table VI.

SOME NOTES ON VARIETIES OF COTTON TESTED IN 1903.

Russell's Big Boll is a hardy, large-bolled and vigorous-growing variety that yields well and is very popular with pickers. In yield of seed cotton it stood second in 1900, first in 1901 and 1902 and seventh in 1903 at the Edgecombe farm; second in 1900, first in 1901, second in 1902 and sixth in 1903 at Red Springs, and third in 1903 at Statesville. In ordinary seasons it is not only prolific but tolerably reliable. It is medium late in date of opening, and hence was caught this year in lands that contained much moisture.

Culpepper's Improved, too, is a large-bolled variety, yielding generally a little less per boll than *Russell's Big Boll*. It ranked fourth in 1900, second in 1901, fourth in 1902, and eighth in 1903 at the Edgecombe farm; first in 1900, second in 1901, first in 1902 and third from Red Springs seed and fifth from Edgecombe seed in 1903 at Red Springs, and fourth at Statesville. This variety is earlier by about ten days and seems to be more subject to variation than *Russell's Big Boll*, but, notwithstanding this last defect, is considered a good, reliable variety. Being a late-maturing variety and having a short growing season this year, especially at the Statesville farm, it was cut off considerably by frost. It has a large-size weed with spreading limbs well-bolled, and holds its cotton well.

Peterkin's Improved is a very popular variety on account of its high-percentage yield of lint—in fact, higher, with one exception, than any other

variety tested thus far. It has a compact, bushy growth, with small bolls, which make it difficult and tedious to gather, and hence is very unpopular with pickers. About one-third of the seed are naked. In yield it stood third in 1901; second in 1902 and sixth in 1903 at the Edgecombe farm; third in 1900, fifth in 1901, third in 1902 and fourth in 1903 at Red Springs, and ninth in 1903 at Statesville. This variety has tolerably high stalks with small, narrow leaves, and hold its bolls in clusters. It is hardy and holds its cotton well.

Truitt's Improved has broad leaves, short lateral limbs and is tolerably late in maturing. This variety occupied third place in 1902 at Edgecombe and eighth in 1903 at all three of the farms. It has a medium-sized boll and yields moderately in percentage of lint.

Daughtridge's ranked fourth in yield of seed cotton in the tests of 1902 and 1903 at the Edgecombe farm. This variety has a smaller seed and boll than *Peterkin's Improved* and produces a tolerably high percentage of lint.

King's Improved has a boll a little smaller than *Peterkin's Improved*, but does not generally yield quite as high percentage of lint. It has a tolerably small stalk with spreading limbs. This is the earliest-maturing variety thus far tested. It occupied third place in 1903 at Edgecombe, fourth in 1902 and seventh in 1903 at Red Springs, and first and second in 1903 at Statesville, where the growing season is comparatively short.

Excelsior Prolific has large, deep-lobed leaves and short, well-matured limbs that bear very small bolls of high percentage of lint. It ranked second in 1903 at Edgecombe, fifth in 1902 and first in 1903 at Red Springs, and sixth in 1903 at Statesville. This is a very promising variety for the eastern part of the State.

Edgewood ranked in 1903 first at Edgecombe, second at Red Springs, and fifth at Statesville. It has a tolerably heavy stalk, large leaves and short stems. It is a rather late-maturing variety, but the results of this year's tests on the eastern farms indicate it to be a very promising cotton for sandy and sandy-loam soils.

Garrard's Improved Prolific ranked in 1903 fifth and seventh at Edgecombe and Statesville respectively. It has a very small boll and seed.

SELECTING SEED FOR IMPROVEMENT.

With cotton it is of the highest importance that seed for planting purposes be selected from plants in the field, having especial reference to total yield of seed cotton, percentage yield of lint, date of maturity, vigor, hardiness, form and size of bolls, leaves, stalks, limbs, etc., because here also, as with animals, like has a decidedly strong tendency to produce or beget like. Above all things, the practice of selecting seed at random at the gin should not be followed, for it cannot possibly be known whether the seed secured in this manner were produced on stalks that bore few or many bolls. If seed of the former kind are obtained, then the tendency of these seeds when planted will be to produce a small yield and *vice versa*. Again, in securing seed from the gin it is generally deferred until late in the reason, and usually seed from the last picking are obtained, which are the poorest seed. It is generally conceded by the best cotton growers that the best seed are from the middle picking.

In selecting a variety of cotton one must not be guided entirely by total yield of seed cotton, as often between two varieties producing about the same yield the one with the smaller yield should be chosen because of its greater production of lint, which sells for from eight to fifteen times as much per pound as seed.

SOURCES OF VARIETIES OF COTTON TESTED IN 1903.

The seed used in the variety tests of cotton at the three farms were obtained from the following sources:

Culpepper's Improved.....Edgecombe Test Farm, Rocky Mount, N. C.
Culpepper's Improved.....Red Springs Farm, Red Springs, N. C.
Peterkin's Improved.....J. A. Peterkin, Fort Motte, S. C.
Daughtridge's.....E. L. Daughtridge, Rocky Mount, N. C.
Truitt's Improved.....Alexander Seed Co., Augusta, Ga.
Russell's Big Boll.....Edgecombe Test Farm, Rocky Mount, N. C.
Excelsior Prolific.....Excelsior Seed Farm, Bennettsville, S. C.
Edgewood.....J. C. Little, Louisville, Ga.
King's Improved.....C. S. Williams, Franklinton, N. C.
King's Improved (Native).....Wesley Sherrill, Statesville, N. C.
Garrard's Improved Prolific.....P. R. Garrard, Nona, Ga.

RESULTS OF DISTANCE TESTS OF COTTON.

These results are found in Tables VII and VIII following:

TABLE VII—RESULTS OF DISTANCE TESTS OF COTTON.

EDGECOMBE FARM.

Size of Plots in Parts of Acre.	Distance Between Rows.	Distance Between Stalks in Rows.	Number Stalks per Plot.		Average Height of Stalks in Inches at Maturity.	Yield of Seed Cotton in Pounds.	
			For Perfect Stand.	By Actual Count.		Per Plot.	Per Acre.
.0350	Three and one-half feet	Twelve inches	420	272	------	52.75	1507.14
.0350	Three and one-half feet	Sixteen inches	315	268	------	52.75	1507.14
.0350	Three and one-half feet	Twenty inches	252	244	------	47.00	1342.86
.0350	Three and one-half feet	Twenty-four inches	210	216	------	47.00	1342.86
.0400	Four feet	Twelve inches	420	300	------	60.25	1506.25
.0400	Four feet	Sixteen inches	315	320	------	53.25	1331.25
.0400	Four feet	Twenty inches	252	280	------	52.25	1306.25
.0400	Four feet	Twenty-four inches	210	223	------	52.50	1312.50

RED SPRINGS FARM.

.1070	Three and one-half feet	Twelve inches	1,332	1,292	24	89.00	831.78
.1070	Three and one-half feet	Sixteen inches	999	927	26	96.00	897.20
.1070	Three and one-half feet	Twenty inches	799	750	27	97.00	906.54
.1070	Three and one-half feet	Twenty-four inches	666	25	30	81.00	757.01
.1223	Four feet	Twelve inches	1,332	1,275	26	108.00	883.07
.1223	Four feet	Sixteen inches	999	930	28	122.00	997.55
.1223	Four feet	Twenty inches	799	760	30	103.00	842.19
.1223	Four feet	Twenty-four inches	666	630	32	89.00	727.72

STATESVILLE FARM.

.0333	Three and one-third feet	Twelve inches	435	303	------	24.75	743.24
.0333	Three and one-third feet	Sixteen inches	327	268	------	24.75	743.24
.0333	Three and one-third feet	Twenty inches	261	221	------	21.00	630.63
.0333	Three and one-third feet	Twenty-four inches	218	234	------	25.00	750.75
.0200	Four feet	Twelve inches	218	135	------	12.25	612.50
.0300	Four feet	Fifteen inches	261	209	------	21.00	700.00
.0300	Four feet	Sixteen inches	245	214	------	20.25	675.00
.0200	Four feet	Twenty inches	131	115	------	17.25	862.50
.0300	Four feet	Twenty-four inches	163	175	------	23.75	791.67

TABLE VIII—COMPILED RESULTS OF DISTANCE TESTS OF COTTON.

EDGECOMBE FARM.

Year.	Yield Seed Cotton in Pounds per Acre at Different Distances.								
	3½ Feet by 12 Inches.*	3½ Feet by 16 Inches.*	3½ Feet by 20 Inches.*	3½ Feet by 24 Inches.*	4 Feet by 12 Inches.	4 Feet by 15 Inches.	4 Feet by 16 Inches.	4 Feet by 20 Inches.	4 Feet by 24 Inches.
1901	1286.0	1384.0	1410.0	1063.0	964.0	--------	--------	893.0	--------
1903	1507.1	1507.1	1342.9	1342.9	1506.3	--------	1331.3	1306.3	1312.5

RED SPRINGS FARM.

1901	284.0	288.0	359.0	447.8	566.9	--------	634.7	--------	--------
1902	1258.6	1310.3	1340.5	1428.9	1229.3	--------	1153.2	1051.4	1165.8
1903	831.8	897.2	906.5	757.0	883.1	--------	997.6	842.2	727.7

STATESVILLE FARM.

1903	743.2	743.2	630.6	750.8	612.5	700.0	675.0	862.5	791.7

*The rows at the Statesville Farm were 3½ feet apart instead of 3½ feet, as indicated.

COMMENTS ON DISTANCE TESTS OF COTTON.

The results of the distance tests conducted at the Edgecombe and Red Springs farms during the past three years indicate that the best distancing for Edgecombe is somewhere between 3½ feet by 16 inches and 3½ feet by 20 inches, while for Red Springs it centers closely around 4 feet by 16 inches.

The general deductions above should be accepted tentatively, as here as with other tests it will require a number of repetitions to arrive at a fair idea of the best width of rows and distance in rows for planting cotton on the types of soils on which these tests were made.

The plats at the three farms were arranged in lateral series, with each test occupying from two to four rows.

As the results of this test are likely to vary somewhat with different varieties, *Culpepper's Improved* seed were used at Red Springs and Statesville, while *Russell's Big Boll* seed were planted at the Edgecombe farm.

In Table VIII is presented a summary of two years' results in Edgecombe, three at Red Springs, and one at Statesville.

III. FERTILIZATION AND CULTIVATION OF CORN AND COTTON.*

CORN.

Culture.—It unquestionably pays well to thoroughly break and broadcast harrow land for corn. Using a two-horse plow and running it 8 to 10 inches deep, and afterwards harrowing with large smoothing harrow, puts the land in nice condition. It is also well to run a small-tooth harrow across corn rows about the time the plants are coming up, and even after they are several inches high, slanting the teeth of the harrow backward. Harrowing in this way saves after-cultivation, and is a quick way of getting over the land. The land being thoroughly broken before the corn is put in the ground, only shallow, level cultivation with some one of the considerable number of good cultivators need be given during the growing season. The one-horse cultivators cover corn rows in two to three furrows, and the two-horse ones at a single trip. The cultivation should be frequent—about every ten days—and if possible just after rains, so as to break any crust formed by showers, leaving a dust mulch to retard the loss of moisture added to the soil in the previous rains. Toward the end of the growing season the cultivators should only be run one to one and a half inches deep, so as to disturb as little as possible the roots of the plants, which by that time are well into the middle of the rows.

Fertilizers for Corn.—The experimental work on the sandy soils of the east, reports of which have been made previously, has progressed far enough, we feel, to draw some conclusions in reference to the best amount and proportions of nitrogen, phosphoric acid and potash for corn. As the results of the past two years' work have not yet been published, the following formulas, based on the results of the first two years' tests and tests in other States with similar soil and climatic conditions, are given as good ones for corn:

For Corn on Land in Fair Condition.

No. 1—

Acid phosphate, 14 per cent phosphoric acid	900 pounds
Cotton-seed meal, 6.59† per cent nitrogen, 2.5 phosphoric acid and 1.5 potash	960 pounds
Kainit, 12.5 per cent potash	140 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.5 per cent; potash, 1.6 per cent; nitrogen, 3.2 per cent (equal to ammonia, 3.9 per cent).

No. 2—

Acid phosphate, 14 per cent phosphoric acid	1,045 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 phosphoric acid and 1.5 potash	520 pounds
Nitrate of soda, 15 per cent nitrogen	225 pounds
Kainit, 12.5 per cent potash	210 pounds
	2,000 pounds

*The formulas presented below are revisions of the ones published in January and March Bulletins, 1902, which are now exhausted. They are reprinted here to meet the large demand for information on this subject.

†6.59 per cent nitrogen equals 8 per cent ammonia.

In this formula one-half of the nitrogen is supplied by nitrate of soda and the other one-half by cotton-seed meal. This mixture will contain: available phosphoric acid, 8.0 per cent; potash, 1.7 per cent; nitrogen, 3.4 per cent (equal to ammonia, 4.0 per cent).

No. 3—

Acid phosphate, 14 per cent phosphoric acid	965 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 phosphoric acid and 1.5 potash	750 pounds
Nitrate of soda, 15 per cent nitrogen	110 pounds
Kainit, 12.5 per cent potash	175 pounds
	2,000 pounds

In this formula one-fourth of the nitrogen is supplied by nitrate of soda and the other three-fourths by cotton-seed meal. This mixture will contain: available phosphoric acid, 7.7 per cent; potash, 1.7 per cent; nitrogen, 3.3 per cent (equal to ammonia, 4.0 per cent).

No. 4—

Acid phosphate, 16 per cent phosphoric acid	835 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 phosphoric acid and 1.5 potash	1,010 pounds
Kainit, 12.5 per cent potash	155 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.9 per cent; potash, 1.7 per cent; nitrogen, 3.3 per cent (equal to ammonia, 4.0 per cent).

No. 5—

Acid phosphate, 14 per cent phosphoric acid	860 pounds
Fish scrap, 8.25 per cent nitrogen and 6.0 per cent phosphoric acid	850 pounds
Kainit, 12.5 per cent potash	290 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 8.6 per cent; potash, 1.8 per cent; nitrogen, 3.5 per cent (equal to ammonia, 4.3 per cent).

No. 6—

Acid phosphate, 16 per cent phosphoric acid	800 pounds
Fish scrap, 8.25 per cent nitrogen and 6.0 phosphoric acid	900 pounds
Kainit, 12.5 per cent potash	300 pounds
	2,000 pounds

This mixture is more concentrated than preceding ones on account of the use of higher grade materials and will contain: available phosphoric acid, 9.1 per cent; potash, 1.9 per cent; nitrogen, 3.7 per cent (equal to ammonia, 4.5 per cent).

No. 7—

Acid phosphate, 14 per cent phosphoric acid	960 pounds
Fish scrap, 8.25 per cent nitrogen and 6.0 phosphoric acid	960 pounds
Muriate of potash, 50 per cent potash	80 pounds
	2,000 pounds

This mixture, too, is more concentrated than the preceding ones on account of the use of a high grade potassic material, muriate of potash, and will contain: available phosphoric acid, 9.6 per cent; potash, 2.0 per cent; nitrogen, 4.0 per cent (equal to ammonia, 4.8 per cent).

No. 8—

Acid phosphate, 14 per cent phosphoric acid	950 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 phosphoric acid and 1.5 potash	1,015 pounds
Muriate of potash, 50 per cent potash	35 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.9 per cent; potash, 1.6 per cent; nitrogen, 3.3 per cent (equal to ammonia, 4.0 per cent).

No. 9—

Acid phosphate, 16 per cent phosphoric acid	900 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 phosphoric acid and 1.5 potash	1,060 pounds
Muriate of potash, 50 per cent potash	40 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 8.5 per cent; potash, 1.8 per cent; nitrogen, 3.5 per cent (equal to ammonia, 4.3 per cent).

No. 10—

Acid phosphate, 14 per cent phosphoric acid	1,365 pounds
Dried blood, 13 per cent nitrogen	555 pounds
Muriate of potash, 50 per cent potash	80 pounds
	2,000 pounds

This mixture is a concentrated one on account of high grade nitrogenous and potassic materials being used and will contain: available phosphoric acid, 9.6 per cent; potash, 2.0 per cent; nitrogen, 3.6 per cent (equal to ammonia, 4.4 per cent).

No. 11—

Acid phosphate, 16 per cent phosphoric acid	1,310 pounds
Dried blood, 13 per cent nitrogen	600 pounds
Muriate of potash, 50 per cent potash	90 pounds
	2,000 pounds

This mixture is quite concentrated on account of the high grade phosphatic and potassic materials used and will contain: available phosphoric acid, 10.5 per cent; potash, 2.3 per cent; nitrogen, 3.9 per cent (equal to ammonia, 4.7 per cent).

Cotton Seed.—Cotton seed may replace the meal in formulas containing meal by allowing 2¼ pounds of seed for one of meal.

Nitrate of Soda.—This material is quick acting because of its easy solubility in water. For this reason when used in a considerable quantity in fertilizers at time of planting, on light sandy land, there is danger of its being leached beyond the reach of the roots of the plants before they can use it. On clay lands and loams having good subsoils to them this danger does not exist, certainly not to the extent that it does on light soils. A small amount of nitrate of soda in the mixture will give the crop a quick start and make its cultivation easier and more economical. Formula No. 3 has been arranged with this idea in view, and in No. 2 one-half the nitrogen comes from nitrate of soda. On light lands it would likely be better to omit the nitrate from the mixture and apply it as a top dressing between the tenth and last of June on early corn. Nitrate of soda may take the place of a portion of the other nitrogen-furnishing materials in any of the formulas, one pound of nitrate being equal in its content of nitrogen to 2.2 pounds cotton-seed meal, 2 pounds fish scrap, 1.2 pounds dried blood. Nitrate of soda is frequently used as a top dressing for corn and is a valuable material for use in this way. A good application is 50 to 75 pounds per acre, distributed along the side of the row or dropped beside the plants and three or four inches from them, or else where there is a ridge in the center it may be distributed on this and when it is thrown out the nitrate will be thrown to the two sides of the row.

Application of Fertilizers to Corn.—On clay lands and loams having good subsoil the fertilizer should be applied in the drill, at or just before planting, at the rate of two to four hundred pounds per acre. On light sandy lands it is best to use 50 to 100 pounds in the drill at time of planting, to give the crop a good start, and the balance of the fertilizer as a side-dressing when the corn has begun to grow well.

Fertilizers for Corn Following Peas, etc.

The best and most profitable yields of corn in our experimental work were where the corn followed velvet beans and other leguminous crops. These crops, with acid phosphate and kainit, or some other potash salt, are the best previous treatment and fertilization for corn. Where light crops of peas have been grown in corn, or cut from the land and the stubble left, it would be safest to add some nitrogen in the fertilizer mixture. In cases of this kind it is suggested that the nitrogen-furnishing material in any of the preceding formulas be reduced one-half. Where corn is to follow good crops of velvet beans, peas or soja beans, especially where the entire crops have been left on the soil, no further application of nitrogen need be made, but it is advised that 200 to 300 pounds per acre of the following mixture, in the drill, be used just before planting:

Acid phosphate	200 pounds
Kainit	100 pounds

COTTON.

Culture.—The remarks regarding the preparation and cultivation of corn also apply with equal force to cotton, unless it be the part regarding breaking the land well before planting. Some doubt the necessity of this for cotton. Cotton is generally grown on ridges. This is necessary on wet soils, but on all fairly well-drained upland and sandy soils we are convinced that level and frequent shallow cultivation, as was indicated for corn, is the best and most economical method to follow in growing cotton. Ridge culture may give better results in very wet years, but taking the seasons as they come the advantage will lie, we think, with flat culture.

Fertilizers for Cotton.—The preliminary remarks regarding fertilizers for corn also apply to cotton, the following formulas being offered tentatively and as the result of our best judgment, after studying the best obtainable data on the subject.

For Cotton on Land in Fair Condition.

No. 1—

Acid phosphate, 14 per cent phosphoric acid	895 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 per cent phosphoric acid and 1.5 per cent potash	790 pounds
Kainit, 12.5 per cent potash	315 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.2 per cent; potash, 2.6 per cent; nitrogen, 2.6 per cent (equal to ammonia, 3.2 per cent).

No. 2—

Acid phosphate, 14 per cent phosphoric acid	1,015 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 phosphoric acid and 1.5 potash	415 pounds
Nitrate of soda, 15 per cent nitrogen	180 pounds
Kainit, 12.5 per cent potash	390 pounds
	2,000 pounds

In this formula one-half of the nitrogen is supplied by nitrate of soda and the other one-half by cotton-seed meal. This mixture will contain: available phosphoric acid, 7.6 per cent; potash, 2.7 per cent; nitrogen 2.7 per cent (equal to ammonia, 3.3 per cent).

No. 3—

Acid phosphate, 14 per cent phosphoric acid	955 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 phosphoric acid and 1.5 potash	605 pounds
Nitrate of soda, 15 per cent nitrogen	90 pounds
Kainit, 12.5 per cent potash	350 pounds
	2,000 pounds

In this formula one-fourth of nitrogen is supplied by nitrate of soda and the other three-fourths by cotton-seed meal. This mixture will contain: available phosphoric acid, 7.4 per cent; potash, 2.6 per cent; nitrogen, 2.6 per cent (equal to ammonia, 3.1 per cent).

No. 4—

Acid phosphate, 16 per cent phosphoric acid	830 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 phosphoric acid and 1.5 potash	830 pounds
Kainit, 12.5 per cent potash	340 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.7 per cent; potash, 2.7 per cent; nitrogen, 2.7 per cent (equal to ammonia, 3.3 per cent).

No. 5—

Acid phosphate, 14 per cent phosphoric acid	850 pounds
Fish scrap, 8.25 per cent nitrogen and 6.0 phosphoric acid	690 pounds
Kainit, 12.5 per cent potash	460 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 8.0 per cent; potash, 2.9 per cent; nitrogen, 2.9 per cent (equal to ammonia, 3.5 per cent).

No. 6—

Acid phosphate, 16 per cent phosphoric acid	790 pounds
Fish scrap, 8.25 per cent nitrogen and 6.0 phosphoric acid	730 pounds
Kainit, 12.5 per cent potash	480 pounds
	2,000 pounds

This mixture is more concentrated than the foregoing ones on account of higher grade materials used and will contain: available phosphoric acid, 8.5 per cent; potash, 3.0 per cent; nitrogen, 3.0 per cent (equal to ammonia, 3.6 per cent).

No. 7—

Acid phosphate, 14 per cent phosphoric acid	1,020 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 phosphoric acid and 1.5 potash	890 pounds
Muriate of potash, 50 per cent potash	90 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 8.3 per cent; potash, 2.9 per cent; nitrogen, 2.9 per cent (equal to ammonia, 3.5 per cent).

No. 8—

Acid phosphate, 16 per cent phosphoric acid	965 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 phosphoric acid and 1.5 potash	940 pounds
Muriate of potash, 50 per cent potash	95 pounds
	2,000 pounds

This mixture is a concentrated one on account of high grade phosphatic and potassic materials used and will contain: available phosphoric acid, 8.9 per cent; potash, 3.1 per cent; nitrogen, 3.1 per cent (equal to ammonia, 3.8 per cent).

No. 9—

Acid phosphate, 14 per cent phosphoric acid	1,045 pounds
Fish scrap, 8.25 per cent nitrogen and 6.0 phosphoric acid	820 pounds
Muriate of potash, 50 per cent potash	135 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 9.8 per cent; potash, 3.4 per cent; nitrogen, 3.4 per cent (equal to ammonia, 4.1 per cent).

No. 10—

Acid phosphate, 16 per cent phosphoric acid	975 pounds
Fish scrap, 8.25 per cent nitrogen and 6.0 phosphoric acid	880 pounds
Muriate of potash, 50 per cent potash	145 pounds
	2,000 pounds

This mixture is considerably more concentrated than the others on account of the high grade materials used and will contain: available phosphoric acid, 10.4 per cent; potash, 3.6 per cent; nitrogen, 3.6 per cent (equal to ammonia, 4.4 per cent).

No. 11—

Acid phosphate, 14 per cent phosphoric acid	1,355 pounds
Dried blood, 13 per cent nitrogen	510 pounds
Muriate of potash, 50 per cent potash	135 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 9.5 per cent; potash, 3.4 per cent; nitrogen, 3.3 per cent (equal to ammonia, 4.0 per cent).

No. 12—

Acid phosphate, 16 per cent phosphoric acid	1,295 pounds
Dried blood, 13 per cent nitrogen	560 pounds
Muriate of potash, 50 per cent potash	145 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 10.4 per cent; potash, 3.6 per cent; nitrogen, 3.6 per cent (equal to ammonia, 4.4 per cent).

Cotton Seed and Nitrate of Soda.—The remarks under corn regarding these two materials apply also to cotton, as do the suggestions concerning the change in the quantity of nitrogen-supplying materials in the formulas should cotton follow peas or any other leguminous crop. In Formula No. 3 one-fourth of the

nitrogen is supplied by nitrate of soda, with the view of giving the crop a quick start, and in No. 2 one-half of the nitrogen comes from this source. On light lands it will be good practice to omit this nitrate from the mixture and apply it as a side-dressing about the middle of June. Good results come from the use of it in this way on heavy types of land. Where land does not produce a good stalk of cotton and fertilizers are used which contain only a moderate amount of nitrogen, or ammonia, good results are obtained from a side-dressing of 50 to 100 pounds of nitrate of soda per acre. The nitrate should be distributed along one side of the row; where there is a ridge in the middle it may be put on this and when the ridge is thrown out the nitrate will be thrown on two sides of the row.

Application of Fertilizer to Cotton.—The fertilizer should be applied in the drill at or just before planting. The quantity used for cotton varies from 200 to 1,000 pounds per acre; 400 to 600 pounds are the more common quantities used of the grade of Formula No. 1. Some of the mixtures in this Bulletin are much more concentrated than No. 1, and when they are used the quantity may be reduced proportionately.

IV. COMPOSTS AND COMPOSTING.

Compost for General Use.—Frequent requests are made for compost formulas, and the following one, with barnyard manure, rich dirt, or woods mould, or all, and acid phosphate and kainit, is well suited for general use:

Barnyard manure, rich dirt or woods mould	1,750 pounds
Acid phosphate	200 pounds
Kainit	50 pounds
	2,000 pounds

With average barnyard manure the above compost would contain: phosphoric acid, 1.7 per cent; potash, .7 per cent, and ammonia, .6 per cent. One ton of this compost is worth between 500 and 600 pounds of the average fertilizer containing 8 per cent of available phosphoric acid, 2 per cent of potash, and 2 per cent of ammonia. It should be applied at the rate of 600 to 1,600 pounds per acre in the drill, 1,400 pounds of the compost being about equal to an application of 400 pounds of the 8-2-2 fertilizer.

The compost may be made under shelter or out of doors. In either case select a place where the soil is compact and arrange it so that the water that may run through the heap will not drain from it. Put down the materials in alternate layers; first, a layer 3 to 6 inches thick, according to the size of the compost to be made, of the manure, woods mould or rich dirt, then sprinkle upon this layers of acid phosphate and kainit, and continue in this way to put down alternate layers of the materials till the compost is complete. If dry, the manure, mould, etc., should be moistened by sprinkling with water and the heap should be brought to a conical or wedge shape, covered with dirt, preferably rich dirt, and thoroughly compacted to prevent undue entrance of air, which brings about heating and injurious fermentation of the heap. The compost must be watched, and if it becomes hot, a hole should be made in the side and toward the top and water poured in to cool it. This is likely to be the case if made under shelter, while out of doors in the winter and early spring

the rains are apt to be sufficient to keep it moist, but here there is danger of loss, especially of the very soluble potash and phosphoric acid, from leaching, and the heaps made out of doors need careful watching to see that they do not get too hot just after making and between rains, and more especially to see that they are thoroughly covered with dirt and compacted, so as to make the water run mostly off the sides instead of through the heap and draining off with the most valuable part of the manure. The heap should remain 40 to 60 days, and may stay longer. Before using it should be thoroughly cut up and mixed by means of hoes and shovels. If the manure, woods mould and dirt are reasonably free from litter and trash, the mixture may be put through a sand screen and be in condition to drill as other fertilizers are. This will require care in selecting the manure, mould and dirt.

Unquestionably there is great advantage, if it is not indeed an absolute necessity, to save scrupulously all the manure and other waste material on and around the farm, to assist in maintaining or increasing its productiveness. One way to do this is to use the compost in some way similar to that suggested in the foregoing. Another and perhaps somewhat cheaper, unless the compost is made at a time when the farm labor is not profitably occupied with other things, is to apply the manure and woods mould, etc., broadcast, where there are large quantities of them, or in the drill, when the amounts are limited and less than 1,500 to 2,000 pounds to the acre, and drill the acid phosphate and kainit or other materials on them. This saves the cost of mixing. Each plan has its advantages and each farmer can decide for himself which best suits his individual case, and which will enable him to save to best advantage these exceedingly important and valuable fertilizer materials on and about the farm, and which go to waste, or partial waste, in far too many cases.

Compost with Cotton Seed.—Frequently cotton seed are used as fertilizer. One difficulty in the way of their use is the killing of the seed so as to prevent them from sprouting and growing. A common custom is to pile them in the field early in the spring and allow them to become wet and afterwards heat. They are then put in the drill as other fertilizers, or sometimes broadcast. They are also killed by composting, and the following compost with cotton seed is a well-balanced and rich one for general farm crops:

Cotton seed, 13⅓ bushels	400 pounds
Acid phosphate	300 pounds
Kainit	75 pounds
Barnyard manure, etc	1,225 pounds
	2,000 pounds

This compost will contain: phosphoric acid, 2.6 per cent; potash, .9 per cent; ammonia, 1.1 per cent. One ton of it is worth between 800 and 900 pounds of the average fertilizer containing 8 per cent available phosphoric acid, 2 per cent ammonia, and 2 per cent potash, and a good application for cotton would be 600 to 1,200 pounds in the drill, and for corn 400 to 800 pounds in the drill.

Compost with Cotton-seed Meal.—Cotton-seed meal may replace the seed in the preceding compost. In fact, it is much better to use some of the insoluble forms of nitrogen or ammonia in composts rather than nitrate of soda or sulphate of ammonia, which are already in easily soluble condition and ready to

feed plants. Besides, there is not the same danger of loss when materials like cotton seed, cotton-seed meal, etc., are used as when nitrate of soda and sulphate of ammonia are employed. The following compost with cotton-seed meal is some richer than the one with seed already given:

Cotton-seed meal	200 pounds.
Acid phosphate	325 pounds
Kainit	100 pounds
Barnyard manure, etc	1,375 pounds
	2,000 pounds

This mixture will contain: phosphoric acid, 2.8 per cent; potash 1.0 per cent; ammonia, 1.2 per cent. One ton of this is equal in fertilizing value to about one-half ton of a mixed fertilizer containing 8 per cent available phosphoric acid, 2 per cent ammonia and 2 per cent potash. A good application of it for cotton would be 400 to 800 pounds in the drill, and for corn 300 to 600 pounds in the drill.

Use of Lime in the Compost.—Where lime is used at all in the making of compost, it should not be put in contact with either the barnyard manure or acid phosphate, as it has an injurious action on both of these, endangering the loss of ammonia from the manure by setting it free and enabling it to pass off in the air, and rendering the phosphoric acid of the acid phosphate insoluble. Where sour muck or black soil is used the lime mixed with these would correct the acidity or sourness and be beneficial.

V. FERTILIZERS FOR TOBACCO.

There are few products whose quality and quantity are more affected by kind of soil and fertilizer than is tobacco. For bright tobacco, the main kind grown in this State, the fine and deep sandy loam with yellow-colored sandy clay subsoil is the type of land most largely used and the one which grows the best grade of this character of tobacco. Generally, the kind of soil that is suited to the production of tobacco is better understood than the fertilizer that should be used on it. Evidence of this is seen in the great variation in the composition of fertilizers sold in the State especially for use on the tobacco crop. In 1901 there were registered with the Department of Agriculture one hundred and eight (108) special fertilizers for tobacco. It is interesting in this connection to note the wide variation as well as the average composition of these fertilizers. The highest amount of available phosphoric acid guaranteed in any of them was 9.25 per cent; the lowest, 5 per cent, and the average 8.12 per cent. The highest amount of ammonia guaranteed was 10 per cent, the lowest 2 per cent, and the average 2.73 per cent. The highest amount of potash guaranteed was 5 per cent; the lowest 1 per cent, and the average 2.64 per cent. These wide variations in the amounts of the valuable fertilizer constituents indicate that the fertilizers themselves must have had very varying effects on the quality and quantity of the tobacco crop.

A study of the experiments in tobacco-growing and a consideration of the experiences of good tobacco growers show that the amounts of ammonia and potash in the average tobacco fertilizers, as stated above, are not as large as are needed to give the best results. It would appear that the largest amount

of ammonia (10 per cent) in any of these "specials" is greater than is required for bright tobacco, while the maximum quantity of potash (5 per cent) in any of the 108 brands is less than is used by numbers of our best bright tobacco growers, especially in the eastern part of the State. A considerable number of these growers either mix their own tobacco fertilizers, or else have them put up according to formulas of their suggestion. Below are given five formulas for mixing fertilizers for tobacco. The grade of those fertilizers will be higher and they will of course cost more than the goods that are generally used in the State on tobacco, but I feel confident that the increased yield will more than justify the additional expense. In THE BULLETIN of the Department of Agriculture and in our correspondence with farmers we have been recommending formulas of about the composition of these for a number of years, and evidence is accumulating which shows that the character of tobacco fertilizers is undergoing quite a considerable change.

No. 1—

Cotton-seed meal	900 pounds
Nitrate of soda	100 pounds
High-grade sulphate of potash	250 pounds
Acid phosphate, 14 per cent	750 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 6.3 per cent; potash, 6.9 per cent; nitrogen, 3.7 per cent (equal to ammonia, 4.5 per cent).

No. 2—

High-grade dried blood	500 pounds
Nitrate of soda	125 pounds
High-grade sulphate of potash	310 pounds
Acid phosphate	1,065 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.4 per cent; potash, 7.7 per cent; nitrogen, 4.3 per cent (equal to ammonia, 5.2 per cent).

No. 3—

Fish scrap	725 pounds
Nitrate of soda	100 pounds
High-grade sulphate of potash	300 pounds
Acid phosphate	875 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.2 per cent; potash, 7.5 per cent; nitrogen, 3.8 per cent (equal to ammonia, 4.6 per cent).

No. 4—

Dried Blood	500 pounds
Nitrate of soda	100 pounds
High-grade sulphate of potash	400 pounds
Acid phosphate	1,000 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7 per cent; potash, 10 per cent; nitrogen, 4.1 per cent (equal to ammonia, 5 per cent).

No. 5—

Cotton-seed meal	700 pounds
Nitrate of soda	100 pounds
High-grade sulphate of potash	300 pounds
Acid phosphate	900 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.2 per cent; potash, 7.7 per cent; nitrogen, 3.1 per cent (equal to ammonia, 3.8 per cent).

Four hundred to one thousand pounds of these mixtures should be used to the acre.

The mixtures made from formulas Nos. 2 and 3 are somewhat more concentrated than that from No. 1, on account of cotton-seed meal containing less ammonia than fish scrap and dried blood. The three formulas are given to enable the use of any one of the three main organic, nitrogenous materials—dried blood, fish scrap and cotton-seed meal. In the coast sections, fish scrap and meal are both easily obtained, some distance inland meal is more accessible, while in the more western end of the tobacco belt it will be found convenient to use dried blood. All three are good sources of ammonia for tobacco. The other materials—nitrate of soda, sulphate of potash and acid phosphate—are the same for all mixtures.

Occasional requests are made for formulas furnishing as much as 10 per cent of potash, and No. 4 has been arranged to meet needs of this nature. It is known that excellent tobacco, in quality and quantity, is grown by the use of fertilizers of this class, and some of our farmers greatly prefer them to others containing less potash. It takes considerable observation and experimentation to determine the best practice in matters of this kind.

A limited quantity of stable manure is very beneficial to tobacco, and it succeeds well after peanuts. These materials add ammonia to the soil, and where heavy applications of fertilizers are to be made in connection with manure, and on peanut land, it would be well not to have so much ammonia in the fertilizers as is used in the ones employed on land not having other ammonia materials put on them. Formula No. 5 is destined to meet cases of this kind. A good many eastern tobacco growers plant tobacco after peanuts, and some of them grow peas between the hills of tobacco, planting them with hoes and putting six to ten peas in a place the latter part of June or early in July. This improves the soil for after-crops, but tobacco grown after tobacco and peas is said not to be of good quality; though, as would be expected, the growth is very large.

Good results will come from the use of high-grade fertilizers, such as are suggested above, or similar ones, and we believe that when once tried there will be no inclination to go back to the lower grade ones now so largely used.

I.—FERTILIZER ANALYSES.

FALL SEASON, 1903—SPRING SEASON, 1904.

By B. W. Kilgore, State Chemist.

The analyses presented in this Bulletin are of samples collected by the fertilizer inspectors of the Department, under the direction of the Commissioner of Agriculture, during the fall months of 1903 and the spring months of 1904, and therefore represent the character of fertilizers the farmers have used on the crops of the past year. They should receive the careful study of every farmer in the State who uses fertilizers, as by comparing the analyses in The Bulletin with the claims made for the fertilizers actually used, the farmer can know whether or not they contained the fertilizing constituents in the amounts they were claimed to be present.

TERMS USED IN ANALYSES.

Water-soluble Phosphoric Acid.—Phosphate rock, as dug from the mines mainly in South Carolina, Florida and Tennessee, is the chief source of phosphoric acid in fertilizers.

In its raw or natural state, the phosphate has three parts of lime united to the phosphoric acid (called by chemists tri-calcium phosphate). This is very insoluble in water, and is not in a condition to be taken up readily by plants. In order to render it soluble in water and fit for plant food, the rock is finely ground and treated with sulphuric acid, which acts upon it in such a way as to take from the three-lime phosphate two parts of its lime, thus leaving only one part of lime united to the phosphoric acid. This one-lime phosphate is what is known as water-soluble phosphoric acid.

Reverted Phosphoric Acid.—On long standing some of this water-soluble phosphoric acid has a tendency to take lime from other substances in contact with it, and to become somewhat less soluble. This latter is known as reverted or gone-back phosphoric acid. This is thought to contain two parts of lime in combination with the phosphoric acid, and is thus an intermediate product between water-soluble and the original rock.

Water-soluble phosphoric acid is considered somewhat more valuable than reverted, because it becomes better distributed in the soil as a consequence of its solubility in water.

Available Phosphoric Acid is made up of the water-soluble and reverted; it is the sum of these two.

Water-soluble Ammonia.—The main materials furnishing ammonia in fertilizers are nitrate of soda, sulphate of ammonia, cotton-seed meal, dried blood, tankage and fish scrap. The first two of these (nitrate of soda and sulphate of ammonia) are easily soluble in water and become well distributed in the soil where plant roots can get at them. They are, especially the nitrate of soda, ready to be taken up by the plants, and are therefore quick-acting forms of ammonia. It is mainly the ammonia from nitrate of soda and sulphate of ammonia that will be designated under the head of water-soluble ammonia.

Organic Ammonia.—The ammonia in cotton-seed meal, dried blood, tankage, fish scrap, and so on, is included under this heading. These materials are insoluble in water, and before they can feed plants they must decay and have their ammonia changed, by the aid of the bacteria of the soil, to nitrates, similar to nitrate of soda.

They are valuable then as plant food in proportion to their content of ammonia, and the rapidity with which they decay in the soil, or rather the rate of decay will determine the quickness of their action as fertilizers. With short season, quick-growing crops, quickness of action is an important consideration, but with crops occupying the land during the greater portion, or all, of the growing season, it is better to have a fertilizer that will become available more slowly, so as to feed the plant till maturity. Cotton-seed meal and dried blood decompose fairly rapidly, but will last the greater portion, if not all, of the growing season in this State. While cotton seed and tankage will last longer than meal and blood, none of these act so quickly, or give out so soon, as nitrate of soda and sulphate of ammonia.

Total Ammonia is made up of the water-soluble and organic; it is the sum of these two.

The farmer should suit, as far as possible, the kind of ammonia to his different crops, and a study of the forms of ammonia as given in the tables of analyses will help him to do this.

FORM OF POTASH IN TOBACCO FERTILIZERS.

Tobacco growers are becoming yearly more disposed to know the form of potash, whether from kainit, muriate or sulphate, which enters into their tobacco fertilizers. Considerable work of this kind has been done for individuals, and we are this season for the first time determining the form of potash in all tobacco brands, for the benefit of tobacco growers.

The term potash from muriate, as reported in the analyses, does not mean, necessarily, that the potash was supplied by muriate of potash. Sulphate or some other potash salt may have been used, but in all fertilizers where the term potash from muriate is used, there is enough chlorine present to combine with all the potash, though it may have come from salt in tankage, kainit, or karnalite. As the objection to the use of muriate of potash in tobacco fertilizers arises from the chlorine present, it does not matter whether this substance is present in common salt or potash-furnishing materials.

The use of sulphate of potash where there is chlorine present in the other ingredients of the fertilizer will not prevent the injurious effect of the chlorine. The term potash from muriate in our analyses, therefore, means that there is sufficient chlorine present in the fertilizer from all sources to combine with the potash to the extent indicated by the analyses.

VALUATIONS.

To have a basis for comparing the values of different fertilizer materials and fertilizers, it is necessary to assign prices to the three valuable constituents of fertilizers—ammonia, phosphoric acid and potash. These figures, expressing relative value per ton, are not intended to represent crop-producing power, or agricultural value, but are estimates of the commercial value of ammonia, phosphoric acid and potash in the materials supplying them. These

values are only approximate, as the cost of fertilizing materials is liable to change as other commercial products do, but they are believed to fairly represent the cost of making and putting fertilizers on the market. They are based on a careful examination of trade conditions, wholesale and retail, and upon quotations of manufacturers.

Relative Value per Ton, or the figures showing this, represents the prices on board the cars at the factory, in retail lots of five tons or less, for cash.

To make a complete fertilizer, the factories have to mix together in proper proportions materials containing ammonia, phosphoric acid and potash. This costs something. For this reason it is thought well to have two sets of valuations—one for the raw or unmixed materials, such as acid phosphate, kainit, cotton-seed meal, etc., and one for mixed fertilizers.

The values used last season were:

VALUATIONS FOR 1903.

In Unmixed or Raw Materials.

For ammonia	13	cents per pound
For phosphoric acid in acid phosphate	4	cents per pound
For phosphoric acid in fine bone meal	3	cents per pound
For phosphoric acid in medium and coarse bone meal	2½	cents per pound
For potash	5	cents per pound

In Mixed Fertilizers.

For ammonia	15	cents per pound
For phosphoric acid	4½	cents per pound
For potash	5½	cents per pound

The valuations decided on for this season, for the reasons already given, are:

VALUATIONS FOR 1904.

In Unmixed Raw Materials.

Phosphoric acid in acid phosphate	4	cents per pound
Phosphoric acid in bone meal	3½	cents per pound
Ammonia	14½	cents per pound
Potash	5	cents per pound

In Mixed Fertilizers.

Phosphoric acid	4½	cents per pound
Ammonia	16½	cents per pound
Potash	5½	cents per pound

HOW RELATIVE VALUE IS CALCULATED.

In the calculation of relative value it is only necessary to remember that so many per cent means the same number of pounds per hundred, and that there are twenty hundred pounds in one ton (2,000 pounds).

With an 8-2-2 goods, which means that the fertilizer contains available phosphoric acid 8 per cent, potash 2 per cent, and ammonia 2 per cent, the calculation is made as follows:

Percentage or Lbs. in 100 Lbs.	Value per 100 Lbs.	Value per Ton, 2,000 Lbs.
8 pounds available phosphoric acid at 4½ cents	0.36 × 20 =	$ 7.20
2 pounds potash at 5½ cents	0.11 × 20 =	2.20
2 pounds ammonia at 16½ cents	0.33 × 20 =	6.60
Total value	0.80 × 20 =	$16.00

Freight and merchant's commission must be added to these prices. Freight rates from the seaboard and manufacturing centers to interior points are given in the following table:

FREIGHT RATES FROM THE SEABOARD TO INTERIOR POINTS.—From the Published Rates of the Associated Railways of Virginia and the Carolinas. In carloads of not less than ten tons each, per ton of 2,000 pounds. Less than carloads, add 20 per cent.

Destination.	From Wilmington, N. C.	From Norfolk and Portsmouth, Va.	From Charleston, S C.	From Richmond, Va.
Advance	$3.20	$3.20	$3.40	$3.20
Apex	2.70		3.80	3.00
Ashboro	3.20	3.20	3.60	3.20
Asheville	4.00	4.00	4.00	4.00
Chapel Hill	2.95	3.20	3.90	3.20
Charlotte	2.65	3.30	3.20	3.20
Clayton	2.48	2.86	3.63	2.83
Cherryville	3.85	3.60	3.40	3.60
Clinton	1.60	3.00	3.20	3.00
Creedmoor	3.00	3.00	3.80	3.00
Cunningham	3.00	2.40	4.00	2.40
Dallas	3.00	3.60	3.40	3.60
Davidson College	3.00	3.20	3.20	3.20
Dudley	1.70	3.00	3.20	3.00
Dunn	2.00	2.80	3.20	2.80
Durham	2.80	2.83	3.60	2.83
Elkin	3.60	3.20	3.60	3.20
Elm City	2.10	2.60	3.20	2.60
Fair Bluff	1.60	3.80	2.40	3.80
Fayetteville	1.80	3.00	3.00	3.00
Forestville	2.85	3.00	3.80	3.06
Gastonia	3.00	3.56	3.36	3.50
Gibson	2.10	3.50	3.50	3.50
Goldsboro	1.80	2.80	3.20	2.80
Greensboro	2.96	3.00	3.40	3.00
Hamlet	2.00	3.00	3.60	3.00
Henderson	2.95	3.00	3.80	3.00
Hickory	3.20	3.60	3.85	3.60
High Point	3.00	3.08	3.40	3.08
Hillsboro	2.88	2.88	2.68	2.88
Kernersville	3.00	3.00	3.40	3.00
Kinston	2.40	2.50	3.50	2.50
Laurel Hill	1.90	2.40	3.80	3.40
Laurinburg	1.90	3.40	3.80	3.40
Liberty	2.72	3.60	3.80	3.60
Louisburg	2.95	3.00	3.80	3.00
Lumberton	1.60	3.60	3.70	3.60
Macon	3.05	3.00	3.85	3.00
Madison	3.10	3.00	3.00	3.00
Matthews	2.60	3.20	3.20	3.20
Maxton	1.80	3.40	3.00	3.40
Milton	3.44	2.40	4.00	2.40
Mocksville	3.36	3.20	3.40	3.20
Morven	2.55	3.60	2.50	3.60
Mount Airy	2.20	3.40	3.80	3.40
Nashville	2.30	2.90	3.40	2.90
New Bern	1.80	1.75	3.95	1.79
Norwood	3.68	3.20	3.20	2.23
Oxford	3.04	2.83	3.80	2.85
Pineville	2.77	3.25	3.00	3.20
Pittsboro	2.60	3.30	4.10	3.30
Polkton	2.40	3.00	2.20	3.00
Raleigh	2.56	2.83	3.63	2.83
Reidsville	3.00	2.96	3.40	2.36
Rockingham	2.10	3.00	3.80	3.00
Rocky Mount	2.20	2.50	3.40	2.50
Ruffin	3.28	2.80	3.40	2.20
Rural Hall	3.28	3.20	3.60	3.20
Rutherfordton	3.05	3.65	3.40	3.65
Salisbury	3.25	3.20	3.20	3.20
Sanford	2.10	3.00	3.40	3.00
Selma	2.40	2.80	3.20	2.80
Shelby	2.95	3.60	3.40	3.60
Siler City	2.60	3.60	3.80	3.60
Smithfield	2.20	2.80	3.20	2.80
Statesville	3.50	3.20	3.60	3.20
Stem	2.95	2.83	3.80	2.83
Tarboro	2.30	2.40	3.00	2.40
Waco	2.90	3.60	3.40	3.60
Wadesboro	2.30	3.00	2.50	3.00
Walnut Cove	3.12	3.00	3.40	3.00
Warrenton	3.05	3.25	4.10	3.25
Warsaw	1.50	3.00	3.20	3.00
Washington	2.65	1.75	2.25	1.50
Weldon	2.55	1.90	3.85	1.90
Wilson	2.00	2.60	3.20	2.60
Winston-Salem	3.00	3.00	3.40	3.05

ANALYSES OF COMMERCIAL FERTILIZERS—FALL SEASON, 1903.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value per Ton at Factory.
					MIXED FERTILIZERS.							
	Brands claiming						**8.00**			**2.00**	**1.00**	**$14.30**
3215	American Fertilizer Co., Norfolk, Va.	American Ammoniated Bone	Connelly Sprgs.	D	4.53	3.31	**7.84**	.69	1.31	2.00	1.23	14 39
3216	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Comet Guano	Connelly Sprgs.	D	5.18	2.25	**7.43**	.41	2.34	2.75	1.38	16.46
3171	Reidsville Fertilizer Co., Reidsville, N. C.	Banner Fertilizer	Ashboro	R	5.23	2.77	8.00	.99	1.76	2.75	1.49	17.09
3196	Va.-Car. Chemical Co., Richmond, Va.	Beef, Blood and Bone Fertilizer	Whiteville	D	5.75	2.27	8.02	.75	1.34	2.09	1.62	15.27
3203	------do	Tinsley's Richmond Brand Guano.	Sloan	D	3.88	3.45	**7.33**	.85	1.71	2.56	1.23	15.65
	Brand claiming						**8.00**			**2.50**	**1.00**	**15.80**
3197	Va.-Car. Chemical Co., Richmond, Va.	Capital Cotton Fertilizer	Whiteville	D	5.38	1.72	**7.10**	.47	2.12	2.59	1.26	**15.55**
	Brands claiming						**8.00**			**2.00**	**2.00**	**15.40**
3146	Ashepoo Fertilizer Co , Charleston, S. C.	Carolina Guano	Mooresville	R	5.93	2.37	8.30	.70	1.76	2.46	2.31	17.39
3218	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Eli Ammoniated Fertilizer	Morganton	R	4.83	2.79	**7.62**	.04	2.60	2.64	2.17	17.16
3134	Columbia Guano Co., Norfolk, Va.	Columbia Soluble Guano	Mt. Olive	R	6.35	1.54	**7.89**	.54	1.78	2.32	2.13	16.41
3202	Etiwan Fertilizer Co., Charleston, S. C.	Etiwan Ammoniated Fertilizer	Taylorsville	R	6.44	1.62	8.06	1.49	.70	2.19	2.00	16.02
3182	Lynchburg Guano Co., Lynchburg, Va.	Lynchburg Soluble	Mooresboro	R	5.65	1.74	**7.39**	.39	1.88	2.27	2.23	15.91
3181	Navassa Guano Co , Wilmington, N. C.	Navassa Grain Fertilizer	Forest City	S	5.78	2.31	8.09	.64	1.75	2.39	**1.98**	16.74
3149	Patapsco Guano Co., Baltimore, Md.	Sea Gull Ammoniated Guano	Mooresville	S	4.95	3.00	**7.95**	.56	1.45	2.01	2.04	15.43
3204	Piedmont-Mt. Airy Guano Co , Baltimore, Md.	Piedmont Plow Brand Guano	Hickory	R	6.13	1.67	**7.80**	.92	1.16	2.08	2.79	16.33
3104	Pocomoke Guano Co., Norfolk, Va.	Pamlico Superphosphate	Stokesdale	R	4.49	4.11	8.60	.90	1.50	2.40	2.19	17.35
3183	Powhatan Chemical Co., Richmond, Va.	Magic Special Fertilizer	Lawndale	D	6.10	2.81	8.91	.51	1.55	2.06	2.16	16.57
3148	Rasin-Monumental Co., Baltimore, Md.	Rasin Empire Guano	Mooresville	R	4.88	2.91	**7.79**	.56	1.59	2.15	**1.82**	15.46
3119	Richmond Guano Co., Richmond, Va.	Premium Brand Fertilizer	Rural Hall	D	6.68	4.44	11.12	.41	1.16	**1.57**	**1.69**	16.58
3172	Royster, F. S., Guano Co., Norfolk, Va.	Farmers' Bone Fertilizer	Starr	R	6.03	2.12	8.15	.46	1.92	2.38	2.38	17.09
3145	Swift Fertilizer Works, Atlanta, Ga.	Swift's Golden Harvest	Mooresville	R	5.13	3.37	8.50	.84	1.40	2.24	2.14	16.72
3144	Va.-Car. Chemical Co., Richmond, Va.	Electric Standard Guano	Mooresville	S	5.73	1.98	**7.71**	.77	1.69	2.46	**1.87**	16.37
3206	------do	Farmers' Friend Fertilizer	Hickory	D	4.05	2.98	**7.03**	.55	1.76	2.31	2.00	15.46
3217	------do	Genuine Bone & Peruvian Guano	Morganton	R	4.55	3.05	**7.60**	.98	1.62	2.60	**1.67**	16.48
3150	----- do	Eureka Ammoniated Bone	Mooresville	R	4.55	3.02	**7.57**	.65	1.63	2.28	**1.82**	15.65
3151	------do	National Fertilizer	Mooresville	R	4.48	2.86	**7.34**	.78	1.56	2.34	**1.75**	15.55
3143	------do	Old Dominion Soluble Guano	Mooresville	R	4.00	4.45	8.45	.80	1.56	2.36	**1.80**	16.67
3133	------do	Owl Brand Guano	Mt. Olive	D	6.05	2.27	8.32	1.13	1.44	2.57	2.29	17.72

	Brand claiming					**8.00**			**2.50**	**2.00**	**16.90**
3194	Navassa Guano Co., Wilmington, N. C.	Ammoniated Soluble Navassa Guano.	Whiteville	N	5.25	1.84	**7.09**	.80	2.02	2.82	**1.91**	16.94
	Brand claiming						**8.00**			**3.00**	**2.00**	**18.40**
3138	Navassa Guano Co., Wilmington, N. C.	Navassa Cotton-seed Meal Special.	Rose Hill	D	6.55	2.03	8.58	.50	2.36	**2.86**	**1.86**	**18.35**
	Brands claiming						**8.00**			**3.00**	**2.50**	**19.95**
3180	Acme Mfg. Co., Wilmington, N. C.	Acme Fertilizer	Fremont	R	6.95	1.77	8.72	.31	2.61	2.92	2.47	19.32
3132	Va.-Car. Chemical Co., Richmond, Va.	Split Silk	Mt. Olive	D	6.08	2.78	9.86	.64	3.02	3.66	2.33	21.51
	Brands claiming						**8.00**			**3.00**	**3.00**	**19.50**
3201	Baugh & Sons Co., Norfolk, Va.	Grand Rapid Guano	Elizabeth City	R	5.75	1.65	**7.40**	2 58	.95	3.53	3.22	20.79
3177	Columbia Guano Co., Norfolk, Va.	Hyco Tobacco Guano	Battleboro	R	5.73	1.91	**7.64**	1.07	1.83	**2.90**	3.08	**18.96**
3141	Va.-Car. Chemical Co., Richmond, Va.	Bright Leaf Tobacco Grower	Faison	R	5.35	2.50	**7.85**	1.04	1.98	3.02	**2.90**	**19.31**
3178	------do	Gold Medal Brand Guano	Warsaw	R	5.23	1.90	**7.13**	.40	2.74	3.14	3.10	**19.25**
3198	------do	Owl Brand Guano for Tobacco	Greenville	R	5.05	2.49	**7.54**	.76	2.28	3.04	**2.44**	18.59
	Brand claiming						**8.00**			**2.50**	**4.00**	**19.10**
3139	Navassa Guano Co., Wilmington, N. C.	Strawberry Top Dressing	Rose Hill	R	6.55	2.60	9.15	1.60	1.63	3.23	**3.97**	22.29
	Brands claiming						**8.00**			**4.00**	**4.00**	**23.60**
3179	Acme Mfg. Co., Wilmington, N. C.	Quick Step Fertilizer	Fremont	D	5.80	1.92	**7.72**	.55	3.66	4.21	**3.92**	23.89
3195	Navassa Guano Co., Wilmington, N. C.	Coree Tobacco Guano	Whiteville	D	6.28	1.19	**7.47**	.95	3.12	4.07	**3.71**	23.00
3137	------do	Navassa Special Truck Guano	Rose Hill	R	6.83	1.98	8.81	1.05	2.81	**3.86**	**3.97**	23.88
	Brands claiming						**9.00**			**2.75**	**2.00**	**18.55**
3135	Columbia Guano Co., Norfolk, Va.	Columbia Cotton-seed Special	Mt. Olive	R	7.93	2.19	10.12	.96	1.79	2.75	**1.90**	19.45
3136	Va.-Car. Chemical Co., Richmond, Va.	Prolific Cotton Grower	Faison	R	6.83	2.65	9.48	.59	2.54	3.13	3.07	21.30
	Brand claiming						**9.00**			**3.00**	**2.00**	**19.30**
3130	Va.-Car. Chemical Co., Richmond, Va.	Cotton-seed Meal Standard Guano.	Mt. Olive	R	7.13	2.51	9.64	.56	2.54	3.10	2.10	20.29
	Brand claiming						**6.00**			**4.00**	**4.00**	**21.80**
3192	Va.-Car. Chemical Co., Richmond, Va.	Tinsley's Strawberry Grower	Wallace	R	5.05	1.40	6.45	.53	3.33	**3.86**	4.18	21.98
	Brand claiming						**6.00**			**5.00**	**7.00**	**28.10**
3140	Baugh & Sons Co., Norfolk, Va.	Baugh's Peruvian Guano Substitute.	Wallace	S	4.70	2.64	7.34	2.84	2.16	5.00	7.17	29.49
	Brand claiming						**7.00**			**7.00**	**5.00**	**32.80**
3199	American Fertilizer Co., Norfolk, Va.	Standard 7 Per Cent Ammoniated Guano.	Greenville	R	3.93	2.47	**6.40**	2.54	4.02	**6.56**	5.35	31.33
	Brand claiming						**13.00**			**2.50**		**19.20**
3124	Baugh & Sons Co., Norfolk, Va.	Baugh's Pure Dissolved Animal Bone.	Winston	R	1.68	10.74	**12.42**	1.36	2.08	3.44		21.50
	Brand claiming						**8.00**				**2.25**	**9.67**
3157	Va.-Car. Chemical Co., Richmond, Va.	McGavock's Special Potash Mixture.	Clemmonsville	R	3.88	3.81	**7.69**				**1.66**	**8.75**
	Brands claiming						**8.00**				**4.00**	**11.60**
3111	Columbia Guano Co., Norfolk, Va.	Special Wheat Mixture	Mt. Airy	R	6.85	3.32	10.17				**3.12**	12.58
3221	Va.-Car. Chemical Co., Richmond, Va.	Carr's Special Wheat Grower	Clyde	D	3.28	3.71	**6.99**				**3.39**	**10.02**
3114	----do	Travers' Special Wheat Compound.	Mt. Airy	R	3.50	4.49	**7.99**				**3.31**	**10.83**
	Brand claiming						**8.50**				**2.00**	**9.85**
3210	Va.-Car. Chemical Co., Richmond, Va.	Old Dominion Dissolved Bone and Potash.	Newton	D	3.78	4.84	8.62				**1.75**	**9.68**

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—FALL SEASON, 1903—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	
	MIXED FERTILIZERS.											
	Brand claiming						**10.00**				**1.00**	**$10.10**
3121	Va.-Car. Chemical Co., Richmond, Va.	Quickstep Soluble Bone and Potash.	Winston	R	4.40	5.29	**9.69**				1.50	10.37
	Brand claiming						**10.00**				**1.50**	**10.65**
3156	Va.-Car. Chemical Co , Richmond, Va.	Great Wheat and Corn Grower	Clemmonsville	R	4.55	4.43	**8.98**				1.52	**9.75**
	Brands claiming						**10.00**				**2.00**	**11.20**
3220	American Fertilizer Co., Norfolk, Va.	Dissolved Bone and Potash for Corn and Wheat.	Connelly Spgs	D	5.43	4.61	10.04				**1.72**	**10.93**
3190	Armour Fertilizer Works, Baltimore, Md.	Phosphate and Potash, No. 1	Ease	R	4.78	4.92	**9.75**				**1.76**	**10.67**
3152	Ashepoo Fertilizer Works, Charleston, S. C.	Enosee Acid Phosphate	Mooresville	D	7.50	2.50	10.00				2.19	11.41
3122	Columbia Guano Co., Norfolk, Va.	Columbia Bone and Potash Mixture.	Winston	R	7.36	3.37	10.73				2.26	12.14
3207	Etiwan Fertilizer Co., Charleston, S. C.	Diamond Soluble Bone with Potash.	Taylorsville	R	3.88	5.97	**9.85**				2.27	11.36
3186	Lynchburg Guano Co., Lynchburg, Va	Lynchburg Dissolved Bone and Potash.	Mooresboro	R	5.53	4.56	10.09				2.13	11.42
3107	Navassa Guano Co., Wilmington, N. C.	Navassa Dissolved Bone and Potash.	Stokesdale	R	4.41	5.62	10.03				**1.81**	11.02
3191	Powhatan Chemical Co., Richmond, Va.	Bone and Potash Mixture	Lawndale	D	6.03	4.48	10.51				**1.78**	11.42
3155	Richmond Guano Co., Richmond, Va.	----do	Advance	R	5.05	5 07	10.12				1.72	11.00
3175	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Bone and Potash Mixture.	Starr	D	8.53	1.97	10.50				3.30	13.08
3208	Swift Fertilizer Works, Atlanta, Ga.	Swift's Wheat Grower Standard Grade Phosphate.	Statesville	D	5.20	5.04	10.24				**1.78**	**11.17**
3109	Va.-Car. Chemical Co., Richmond, Va.	Blue Ridge Wheat Grower	Mt. Airy	R	5.43	5.74	11.17				**1.97**	12.42
3209	------do	B. P. Potash Mixture	Hickory	D	5.23	4.76	**9.99**				**1.76**	**10.93**
3222	------do	Bone and Potash Compound	Hendersonville	R	5.45	4.85	10 30				1.77	11.20
3123	------do	Capital Bone and Potash Compound.	Winston	R	5.81	6.38	12.19				**1.94**	13.10
3158	------do	Durham Bone and Potash Mixture.	Clemmonsville	D	4.83	4.51	**9.34**				**1.05**	**9.56**
3189	------do	High Grade Alkaline Bone and Potash.	PattersonSpgs.	D	5.50	4.71	10.22				**1.91**	11.30

3112	------do	Mammoth Wheat and Grass Grower.	Mt. Airy	D	5.39	5.35	10.74				1.54	11.36
3188	------do	Owl Brand Acid Phosphate and Potash.	PattersonSpgs.	R	5.10	4.95	10.05				1.92	11.16
3153	------do	Standard Wheat Grower	Mooresville	D	5.25	4.42	**9.67**				1.78	**10.66**
3120	------do	Winston Bone and Potash Compound.	Winston	R	4.88	5 34	10.22				2.17	11.59
	Brands claiming						**10.00**				3.00	**12.30**
3173	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Morris & Scarboro's Special Bone and Potash Mix. for Wheat.	Ashboro	D	7.40	4.47	11.87				2.39	13.31
3174	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	McCrary's Special for Wheat and Grass.	Ashboro	D	5.38	3.14	8.52				3.29	13.74
3223	Va.-Car. Chemical Co , Richmond, Va.	Diamond Wheat Mixture	Union Mills	R	5.18	4.53	**9.71**				3.26	12.32
	Brands claiming						**10.00**				4.00	**13.40**
3187	Lynchburg Guano Co., Lynchburg, Va.	S. W. Special Bone and Potash Mixture.	Mooresboro	R	5.40	4.57	**9.97**				3.17	**12.46**
3185	Swift Fertilizer Works, Atlanta, Ga.	Swift's Farmers' Home High Grade Phosphate and Potash.	Lattimore	D	4.68	4.99	**9.67**				3.60	**12.66**
3110	Va.-Car. Chemical Co., Richmond, Va	Winner Grain Mixture	Mt Airy	R	4.95	4.67	**9.62**				3.29	**12.28**
	Brand claiming						**11.00**				2.00	**12.10**
3108	Pocomoke Guano Co , Norfolk, Va.	Alkali Bone	Stokesdale	S	7.51	3.73	11.24				1.88	12.18
	Brand claiming						**12.00**				4.00	**15.20**
3106	Navassa Guano Co., Wilmington, N. C.	Navassa Special Wheat Grower	Stokesdale	R	7.44	4.78	12 22				3.90	15.29

Raw or Unmixed Fertilizer Materials.

	Brands claiming						**10.00**					**8.00**
3126	Richmond Guano Co., Richmond, Va.	Old Homestead Dissolved Bone	Rural Hall	D	4.65	6.72	11.37					9.10
3162	Va.-Car. Chemical Co., Richmond, Va.	Almont Acid Phosphate	Clemmonsville	R	3.90	4.68	**8.58**					**6.86**
3129	------do	Champion Acid Phosphate	Winston	D	5.78	5 78	11.56					9.25
3160	------do	Durham Acid Phosphate	Clemmonsville	R	2.90	5.70	**8.60**					**6.88**
3212	------do	Horseshoe Brand Acid Phosphate	Statesville	N	3.68	5.73	**9.41**					**7.53**
3168	------do	Owl Brand Acid Phosphate	Clemmonsville	D	3.85	5.83	**9.68**					**7.74**
	Brands claiming						**12.00**					**9.60**
3127	Columbia Guano Co., Norfolk, Va.	Columbia Acid Phosphate	Winston	D	9.08	4.11	13.19					10.55
3125	Royster, F. S., Guano Co., Norfolk, Va.	Royster's XX Acid Phosphate	Rural Hall	D	7.78	4.45	12.23					9.78
3213	Swift Fertilizer Works, Atlanta, Ga.	Swift's Chattahoochee Standard Grade Acid Phosphate.	Statesville	D	6.05	5.04	**11.09**					**8.87**
3128	Va.-Car. Chemical Co., Richmond, Va.	Capital S. C. Bone	Winston	D	6.05	5.77	**11.82**					**9.46**
3167	------do	Royster's High Grade Acid Phosphate.	Mocksville	N	6.30	6.30	12.60					10.08
3225	------do	Standard Acid Phosphate	Clyde	D	5.93	6.59	12.52					10.02
	Brands claiming						**13.00**					**10.40**
3164	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Sterling High Grade Acid Phosphate.	Mocksville	S	8.60	5.05	13.65					10.92

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ANALYSES OF COMMERCIAL FERTILIZERS—FALL SEASON, 1903—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	
				RAW OR UNMIXED FERTILIZER MATERIALS.								
3165	Etiwan Fertilizer Works, Charleston, S.C.	Diamond Dissolved Bone	Mocksville	D	9.85	3.26	13.11					$ 10.49
3115	Navassa Guano Co., Wilmington, N. C.	Navassa High Grade Dissolved Bone.	Stokesdale	N	8.55	6.56	15.11					12.09
3159	Richmond Guano Co., Richmond, Va.	Premium Dissolved Bone	Advance	D	7.15	6.19	13.34					10.67
3214	Va.-Car. Chemical Co., Richmond, Va.	Durham Double Bone Phosphate	Hickory	N	6.93	4.52	**11.45**					**9.16**
3161	------do	Fulp's High Grade Acid Phosphate.	Clemmonsville	R	6.20	6.00	**12.20**					**9.76**
3226	------do	Norfolk Best Acid Phosphate	Asheville	N	6.60	6.37	**12.97**					**10.38**
3211	------do	Old Dominion High Grade Bone Phosphate.	Taylorsville	N	7.23	4.26	**11.49**					**9.19**
3227	------do	Owl Brand High Grade Phosphate.	Rutherfordton	N	7.25	5.39	**12.64**					**10.11**
3154	------do	Standard Dissolved S. C. Bone	Mooresville	N	7.65	4.05	**11.70**					**9.36**
3163	------do	Tinsley's Dissolved S. C. Phosphate.	Clemmonsville	D	5.88	7.02	**19.20**					**10.32**
3166	------do	Victor High Grade Acid Phosphate.	Mocksville	R	6.00	7.08	13.08					10.46
	Brands claiming						**14.00**					**11.20**
3117	Pocomoke Guano Co., Norfolk, Va.	Peerless Acid Phosphate	Stokesdale	D	11.13	4.07	15.20					12.16
3224	Swift Fertilizer Works, Atlanta, Ga.	Swift's Cultivator H. G. Acid Phosphate.	Sylva	D	6.15	7.89	14.04					11.23
3116	Va.-Car. Chemical Co., Richmond, Va.	Valley of Virginia Phosphate	Stokesdale	D	8.45	6.81	15.26					12.21
	Brand claiming										**2.00**	**2.00**
3169	Lee, A. S., & Son, Richmond, Va.	Lee's Prepared Agricultural Lime.	Mocksville	D							2.07	2.07
	Brand claiming									**3.00**		
3176	Armour Fertilizer Works, Savannah, Ga.	Ammoniated Raw Bone Meal	Ashboro	D						4.00		*25.10
	Brand claiming									**4.00**	**3.80**	
3170	Mortimer, Edmund, & Co., New York	Genuine Peruvian Guano	Ashboro	S				2.45	1.65	4.10	3.81	†28.21

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*Total Phosphoric Acid found, 24.50, valued in Bone Meal at 3 cents per pound. †Total Phosphoric Acid found, 19.53, valued at 3 cents per pound.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1904.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
	MIXED FERTILIZERS.														
	Brands claiming						**8.00**			**2.00**	**1.00**				**$14.90**
3263	American Agricultural Chemical Co., New York.	Ammoniated Bone Superphosphate.	Edenton	R	5.48	2.19	**7.67**	1.11	1.68	2.79	1.37				17.42
3588	American Fertilizer Co., Norfolk, Va.	American Ammoniated Bone	Waco	R	5.18	2.61	**7.79**	.50	1.56	2.06	**.94**				15.04
3278	Baugh & Sons Co., Norfolk, Va.	Baugh's Bone Superphosphate and Ammoniated Dissolved Animal Bone.	Waco	R	2.40	5.36	**7.76**	.54	1.78	2.32	1.38				16.16
3513	Rasin-Monumental Co., Baltimore, Md.	Rasin's Dixie Guano	Lumberton	S	6.43	2.46	8.89	.38	1.76	2.14	1.50				16.73
3671	Reidsville Fertilizer Co., Reidsville, N. C.	Banner Fertilizer	Reidsville	R	4.83	2.35	**7.18**	.80	1.34	2.14	**.94**				**14.56**
3745	Richmond Guano Co , Richmond, Va.	Bone Mixture	Springhope	R	6.28	2.47	8.75	.74	1.68	2.42	1.24				17.22
3480	Royster, F S., Guano Co., Norfolk, Va.	Special Compound	Springhope	D	5.93	2.05	**7.98**	.68	1.32	**2.00**	1.23				15.13
3410	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Star Brand Guano.	Fremont	S	7.00	1.74	8.74	.60	1.66	2.26	1.32				16.78
3565	------do	------do	Concord	R	5.58	2.39	**7.97**	.52	1.74	2.26	1.12				15.86
3308	------do	Beef, Blood and Bone Fertilizer	Whiteville	D	5.55	1.62	**7.17**	.66	1.38	2.04	.99				**14.28**
3536	------do	Davie & Whittle's Owl Brand, No. 2.	Lumberton	S	6.70	1.76	8.46	.88	1.38	2.26	1.34				16.55
3716	------do	------do	Kenly	R	4.73	2.42	**7.15**	.78	1.26	**2.04**	1.44				**14.75**
3650	------do	Durham Ammoniated Fertilizer	Haw River	R	4.23	3.01	**7.24**	------	1.96	**1.96**	1.16				**14.26**
3473	------do	Orient Complete Manure	Springhope	R	6.70	2.05	8.75	.54	1.34	**1.88**	1.37				15.58
3516	------do	Progressive Farmer Guano	Creswell	R	5.10	2.39	**7.49**	.06	1.84	**1.90**	2.51				15.77
3603	------do	Queen of the Harvest	Hillsboro	R	4.55	4.04	8.59	.34	1.64	**1.98**	1.10				15.48
3701	------do	Standard Raw Bone Sol. Guano	Autryville	R	6.80	2.61	9.41	.38	1.78	2.16	1.20				16.92
3512	------do	Tinsley's Richmond Brand Guano.	Lumberton	S	7.13	2.04	9.17	1.30	1.98	3.28	1.11				20.30
3605	------do	Vinco Guano	Burlington	R	3.95	3.83	**7.78**	.88	1.30	2.18	1.06				15.36
3680	------do	Yadkin Complete Fertilizer	Kernersville	R	3.53	2.12	**6.65**	----	2.00	2.00	**.72**				**13.38**
	Brands claiming						**8.00**			**2.00**	**1.50**				**15.45**
3453	American Fertilizer Co., Norfolk, Va.	Peruvian Mixture	Edenton	R	4.55	3.30	**7.85**	.80	1.26	2.06	1.95				16.08
3529	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Crown Ammoniated Guano	Davidson	R	5.55	1.51	**7.06**	.46	2.10	2.56	2.14				17.16

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1904—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.										
3273	Imperial Co., Richmond, Va.	Imperial Cotton Grower	Edenton	R	3.58	3.87	**7.45**	.68	1.89	2.57	1.62				$ 16.97
3348	------do	Standard Premium Guano	Washington	R	4.75	2.64	**7.39**	.64	1.36	2.00	1.63				**15.04**
	Brands claiming						**8.00**			**2.50**	**1.00**				**16.55**
3304	MacMurphy, W. C., Co., Charleston, S.C.	Standard Cotton Grower	Fair Bluff	D	6.78	2.27	9.05	1.14	1.29	**2.43**	1.34				17.64
3306	Va.-Car. Chemical Co., Richmond, Va.	Capital Cotton Fertilizer	Whiteville	R	5.20	2.16	**7.36**	.32	2.19	2.51	1.50				16.56
	Brands claiming						**8.00**			**2.50**	**1.50**				**17.10**
3532	Va.-Car. Chemical Co., Richmond, Va.	Charlotte Ammoniated Fertilizer	Lumberton	R	6.43	2.23	**8.66**	.46	2.06	2.52	1.95				18.26
3464	------do	Raw Bone Superphosphate	Wilson	R	6.05	1.93	**7.98**	.78	1.80	2.58	1.92				17.81
	Brand claiming						**8.00**			**2.75**	**1.00**				**17.37**
3546	Camp, W. H., Mfg. Co., Petersburg, Va.	Camp's Prepared Chemicals	Edenton	R	3.68	4.15	**7.83**	2.18	.56	**2.74**	1.46				17.70
	Brands claiming						**8.00**			**2.00**	**2.00**				**16.60**
3694	Acme Mfg. Co., Wilmington, N. C.	Gem Fertilizer	Hillsboro	R	5.75	2.29	8.04	.17	1.81	**1.98**	**1.69**				**15.63**
3607	American Agricultural Chemical Co., New York.	Canton Chemical Baker's Fish Guano.	Catawba	S	4.70	2.96	**7.66**	1.38	.56	**1.94**	2.21				**15.73**
3457	------do	Canton Chemical Game Guano	Elizabeth City	R	5.70	2.26	**7.96**	1.32	.96	2.28	2.31				17.23
3375	------do	Purity Guano	Edenton	R	5.58	2.51	8.09	.87	1.26	2.13	2.00				16.51
3454	------do	Triumph Soluble Guano	Edenton	R	5.05	3.56	8.61	.76	1.42	2.18	2.01				17.16
3700	------do	Zell's Calvert Guano	Aulander	R	5.68	2.49	8.17	.38	1.68	2.06	2.00				16.35
3699	------do	Zell's Fish Guano	Aulander	S	5.43	2.54	**7.97**	.34	1.54	1.88	**1.92**				**15.49**
3317	American Fertilizer Co., Norfolk, Va.	Bone and Peruvian Guano	Warsaw	R	6.00	1.78	**7.78**	.44	1.62	2.06	2.00				**16.00**
3443	Armour Fertilizer Works, Baltimore, Md.	Armour's General Fertilizer	Faison	R	7.40	1.39	8.79	------	2.21	2.21	**1.98**				17.36
3282	Arps, G. L., & Co., Norfolk, Va.	High Grade Premium Guano	Edenton	R	3.58	3.68	**7.26**	.48	1.75	2.23	2.50				16.64
3400	Atlantic Chemical Co., Norfolk, Va.	Atlantic Soluble Guano	Mt. Olive	R	4.98	2.07	**7.05**	.28	2.02	2.30	2.84				17.06
3243	Baugh & Sons Co., Norfolk, Va.	Baugh's Animal Bone Potash Compound for all Crops.	Washington	R	5.38	2.59	**7.97**	1.06	1.75	2.81	2.15				18.81
3451	------do	Baugh's Fish Mixture	Edenton	R	5.40	2.93	8.33	.52	1.56	2.08	2.58				17.20
3269	Bragaw, Wm., & Co., Washington, N. C.	Old Reliable Premium High Grade for all Crops.	Washington	S	5.60	2.32	**7.92**	.66	1.34	2.00	2.13				16.07
3260	------do	Tar Heel Special Guano for All Crops.	Washington	R	5.78	2.22	8.00	.93	1.35	2.28	2.13				17.07
3357	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Eli Ammoniated Fertilizer	La Grange	R	6.08	2.04	8.12	.61	2.08	2.69	2.28				18.69

3312	Columbia Guano Co., Norfolk, Va.	Columbia Soluble Guano	Mt. Olive	S	6.88	1.26	8.14	1.01	1.73	2.74	2.25				18.84
3341	do	do	Edenton	R	6.65	2.20	8.85	.72	1.56	2.28	**1.97**				17.66
3585	Etiwan Fertilizer Co., Charleston, S. C.	Etiwan Ammoniated Fertilizer	Mooresville	D	6.50	2.16	8.66	1.68	.66	2.34	**1.86**				17.56
3589	do	Plow Brand Ammoniated Fertilizer.	Cherryville	D	8.30	1.53	9.83	1.81	.49	2.30	**1.70**				18.31
3611	Eureka Fertilizer Co., Perryville, Md.	Farmers' Favorite Bone Phosphate.	Elizabeth City	R	7.83	1.45	9.28	.92	1.04	**1.96**	**1.77**				16.77
3542	Griffith & Boyd, Baltimore, Md.	Ammoniated Bone Phosphate	Elizabeth City	R	7.28	1.25	8.53	.12	2.10	2.22	2.14				17.36
3490	Hadley, J C., & Co., Wilson, N. C.	John Hadley's Special High Grade Plant Food.	Wilson	R	7.63	1.37	9.00	.30	2.16	2 46	3.38				19.84
3477	Hampton Guano Co., Norfolk, Va.	Shirley Superphosphate	Springhope	R	4.18	3.27	**7.45**	.90	1.10	2.00	2.26				**15.79**
3252	Harrell, S. B., & Co., Norfolk, Va.	Harrell's Champion Cotton and Peanut Grower.	Elizabeth City	R	5.30	2.69	**7.99**	1.01	1.60	2.61	2.13				18.15
3657	Imperial Co., Norfolk, Va.	High Grade Excelsior Guano	Edenton	S	4.25	3.54	**7.79**	.68	1.32	2.00	2.47				16.33
3773	do	Imperial Champion Guano	Jackson	S	5.83	1.86	**7.69**	.50	1.50	2.00	**1.90**				15.61
3374	do	do	Edenton	R	5.65	2.28	**7.93**	.86	1.34	2.20	**1.96**				16.55
3496	do	Imperial Cisco Soluble Guano	Edenton	S	4.58	3.27	**7.85**	.64	2.38	3.02	2.48				19.76
3389	do	Imperial Peanut and Corn Guano.	Hertford	R	4.75	2.91	**7.66**	.88	1.30	2.18	**1.75**				16.01
3714	Lister's Agr. Chemical Works, Newark, N. J.	Lister's Success Fertilizer	Princeton		5.48	2.57	8.05	.76	1.30	2.06	2.01				16.26
3358	Meadows, E. H. & J. A., Co., New Bern, N. C.	Meadows' Cotton Guano	Kinston	R	5.45	2.68	8.13	.74	1.72	2.46	2.15				17.80
3486	Miller Fertilizer Co., Baltimore, Md.	Ammoniated Dissolved Bone	Elm City	S	5.10	2.47	**7.57**	1.12	1.46	2.58	2.35				17.91
3404	Navassa Guano Co., Wilmington, N. C.	Navassa Cotton Fertilizer	Teacheys	R	5.63	2.32	**7.95**	.78	1.24	2.02	**1.59**				**15.57**
3638	do	Navassa Cotton-seed Meal Guano	Rose Hill	R	5.25	2.87	8.12		2.42	2.42	2.62				18 18
3601	do	Navassa Grain Fertilizer	Hickory	R	5.50	2.53	8.05	.46	1.32	**1.78**	2.00				**15.32**
3554	New Bern Cotton Oil and Fertilizer Co., New Bern, N. C.	Craven Cotton Guano	Seven Springs	R	6.15	1.19	8.34	.08	2.14	2.22	2.61				17.70
3553	do	Greene County Standard Fertilizer.	La Grange	R	6.33	1.94	8.27	.18	1.96	2.14	2.39				17.14
3294	Patapsco Guano Co., Baltimore, Md.	Sea Gull Ammoniated Guano	Mt. Olive	R	6.28	1.73	8.01	1.05	1.24	2.29	2.08				17.05
3467	do	Planters' Favorite	Taylorsville	R	2.95	4.27	**7.22**	.48	1.76	2.24	2.20				16.30
3433	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Bone and Peruvian Mixture.	Edenton	R	7.73	.56	8.29	.96	1.04	2.00	2.34				16.64
3562	do	Piedmont Plow Brand	Concord		6.43	1.80	8.23	1.28	.84	2.12	**1.98**				16.58
3402	do	Piedmont Special for Cotton, Corn and Peanuts.	Mt. Olive	S	7.15	1.20	8.35	1.04	1.00	2.04	2.61				17.12
3250	Pocomoke Guano Co., Norfolk, Va.	L. P. H. Premium	Edenton	R	5.45	2.58	8.03	.72	1.79	2.51	2 13				17.85
3557	do	Pamlico Superphosphate	Mooresville	R	5.10	2.65	**7.75**	.52	1.80	2.32	2.22				17.07
3360	Powhatan Chemical Co., Richmond, Va.	Magic Cotton Grower	Kinston	R	6.25	1.87	8.12	1.22	1.83	3.05	3.80				21.55
3376	Ober, G , & Son Co , Baltimore, Md.	Special Cotton Compound	Edenton	R	9.00	1.14	10.14	.83	1.36	2.19	2.41				19.00
3672	Reidsville Fertilizer Co., Reidsville, N. C.	Champion Guano	Reidsville	R	4.88	2.56	**7.44**	.80	**1.56**	2.36	2.09				16.78
3690	Richmond Guano Co., Richmond, Va.	Hunter & Dunn's Ammoniated Fertilizer.	Raleigh	S	4.63	2.61	**7.24**	.58	1.68	2.26	2.17				16.36
3427	do	Premium Brand Fertilizer	Edenton	S	7.28	1.19	8.47	.62	1.38	2.00	2.41				16.88
3510	do	Premium Tobacco Fertilizer	Whitakers	S	5.53	3.03	8.56	.06	2.08	2.14	2.25				17.24
3276	Royster, F. S., Guano Co., Norfolk, Va.	Farmers' Bone Fertilizer	Williamston	S	6.63	1.73	8.36	.82	1.51	2.33	**1.81**				17.20
3772	do	do	Jackson	S	6.40	1.29	**7.69**	.56	1.60	2.16	2.05				16.31

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1904—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.										
3538	Swift Fertilizer Works, Atlanta, Ga.	Swift's Golden Harvest Standard Grade Guano.	Mooresville	R	4.28	3.64	**7.92**	.54	1.90	2.44	2.37	----	----	----	$ 17.79
3408	Tuscarora Fertilizer Co, Baltimore, Md.	Tuscarora Standard	Rose Hill	R	6.50	1.61	8.11	.42	2.28	2.70	**1.89**	----	----	----	18.29
3436	Upshur, R. L., Norfolk, Va	Upshur's Grain, Grass and Cotton Guano.	Elizabeth City	R	4.13	2.76	**6.89**	1.00	1.40	2.40	**1.79**	----	----	----	16.09
3316	Va.-Car. Chemical Co., Richmond, Va	Allison & Addison's Anchor Brand Fertilizer.	Warsaw	R	6.00	1.48	**7.48**	.63	1.47	2.10	2.06	----	----	----	**15.93**
3505	------do	Ajax	Enfield	R	6.30	1.89	8.19	.82	1.54	2.36	2.01	----	----	----	17.37
3481	------do	Cotton-seed Meal Soluble Guano	Springhope	R	6.30	2.97	9.27	----	----	2.00	2.01	----	----	----	17.16
3679	------do	Diamond Dust	Smithfield	S	6.30	1.87	8.17	.96	1.28	2.24	2.12	----	----	----	17.08
3397	------do	Eagle Island Ammoniated Guano.	Goldsboro	R	5.13	2.33	**7.46**	.44	1.90	2.34	2.34	----	----	----	17.01
3409	------do	Electric Standard Guano	Goldsboro	R	5.73	1.69	**7.42**	.78	1.08	**1.86**	2.12	----	----	----	**15.15**
3472	------do	Eureka Ammoniated Bone	Springhope	R	5.93	1.96	**7.99**	.62	1.46	2.06	2.13	----	----	----	16.33
3431	------do	Farmers' Favorite Fertilizer	Beston	R	7.78	1.34	9.12	.76	1.52	**1.68**	2.25	----	----	----	16.23
3284	------do	Farmers' Friend Fertilizer	Edenton	R	4.95	2.36	**7.31**	.56	1.84	2.40	2.23	----	----	----	16.95
3327	------do	Genuine Bone and Peruvian Guano.	Clinton	R	5.68	1.70	**7.38**	.59	1.55	2.14	2.87	----	----	----	16.86
3346	------do	Genuine Slaughterhouse Bone Guano.	Edenton	R	4.30	3.05	**7.35**	.72	1.60	2.32	2.19	----	----	----	16.68
3623	------do	High Grade Tobacco Guano	Chapel Hill	R	4.38	3.43	**7.81**	.67	1.39	2.06	**1.84**	1.84	----	4.75	**15.86**
3325	------do	King Cotton Grower	Faison	R	5.95	1.55	**7.50**	.55	2.33	2.88	2.39	----	----	----	18.83
3652	------do	Leader	Belmont	R	5.40	2.57	**7.97**	.10	1.90	2.00	**1.75**	----	----	----	**15.70**
3232	------do	National Fertilizer	Belmont	R	6.38	1.92	8.30	.54	1.86	2.40	3.08	----	----	----	18.78
3709	------do	------do	Charlotte	R	5.70	1.59	**7.29**	.38	1.66	2.04	**1.86**	----	----	----	**15.34**
3537	------do	------do	Lumberton	R	5.40	2.98	**7.38**	1.16	.80	**1.96**	**1.81**	----	----	----	**15.06**
3622	------do	National Special Tobacco Fertilizer.	Durham	R	5.25	2.69	**7.94**	.38	1.50	1.88	2.02	2.02	----	4.55	**15.57**
3246	------do	Old Dominion Soluble Guano	Washington	R	4.60	2.55	**7.15**	1.03	1.46	2.49	**1.78**	----	----	----	16.61
3301	------do	Old Hickory Guano	Fair Bluff	R	5.55	1.96	**7.51**	1.18	1.23	2.41	2.22	----	----	----	17.15
3424	------do	Owl Brand Guano	Edenton	R	5.30	1.79	**7.09**	.30	2.08	2.38	2.33	----	----	----	16.80
3401	------do	Plant Food	Mt. Olive	R	5.30	2.38	**7.68**	1.52	2.02	3.54	2.94	----	----	----	21.47
3502	------do	Soluble Ammoniated Guano	Scotland Neck	D	4.88	2.36	**7.24**	.50	1.72	2.22	2.50	----	----	----	16.59

3366	Va.-Car. Chemical Co., Richmond, Va.	Tinsley's Lee Brand Guano	Jacksonville	R	5.75	2.07	**7.82**	.46	1.18	**1.64**	2.48				15.18
3704	do	Tinsley's Stonewall Guano	Rose Hill	S	5.45	1.75	**7.20**	1.00	1.20	2.20	2.01				15.85
3302	do	Winston's Special for Cotton	Fair Bluff	R	6.03	2.16	8.19	.15	1.98	2.13	2.03				16.41
	Brands claiming						**8.00**			**2.50**	**2.00**				**17.65**
3489	Acme Mfg. Co., Wilmington, N. C.	Acme Standard Guano	Elm City	D	6.20	1.94	8.14	1.00	1.58	2.58	2.16				18.22
3307	do	Lattimer's Complete Fertilizer	Fair Bluff	R	6.75	1.61	8.36	1.42	1.18	2.60	2.03				18.34
3411	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Eclipse Ammoniated Guano	Fremont	R	6.13	1.28	**7.41**	.32	2.68	3.00	2.42				19.23
3552	Columbia Guano Co., Norfolk, Va.	Columbia High Grade Tobacco Guano.	La Grange	D	6.90	1.94	8.84	.82	1.72	2.54	**1.93**				18.46
3449	Lister's Agricultural Chemical Works, Newark, N. J.	Lister's Ammoniated Dissolved Bone.	Wilson	D	6.35	2.05	8.40	.90	1.98	2.88	2.17				19.45
3235	Navassa Guano Co., Wilmington, N C.	Navassa Ammoniated Soluble Guano.	Wallace	D	5.55	1.92	**7.47**	1.08	1.51	2.59	2.00				17.47
3446	Va.-Car. Chemical Co., Richmond, Va.	G. E. Special Tobacco Guano	Wilson	R	6.30	1.65	**7.95**	1.26	1.48	2.74	**1.89**	1.89		3.25	18.28
	Brand claiming						**8.00**			**2.25**	**2.25**				**17.10**
3426	Richmond Guano Co., Richmond, Va.	Special Premium Brand for Tobacco.	Edenton	R	6.85	1.55	8.40	.68	1.66	2.34	2.74	2.74		9.15	18.30
	Brands claiming						**3.00**			**2.50**	**2.50**				**18.20**
3506	American Fertilizer Co , Norfolk, Va.	Bob White Fertilizer for Tobacco.	Whitakers	R	4.29	2.55	**6.84**	1.34	1.72	3.06	**1.61**	1.61		2.3	**18.02**
3353	Meadows, E. H. & J. A., Co., New Bern, N. C.	Meadows' All Crop Guano	La Grange	R	6.33	2.22	8.55	.75	1.89	2.64	2.60				19.27
	Brands claiming						**8.00**			**2.00**	**3.00**				**17.10**
3666	Crow Brothers, Monroe, N. C.	Crow's Corn and Cotton Guano	Monroe	S	6.33	1.83	8.16	.20	1.56	**1.76**	3.10				**16.56**
3646	Navassa Guano Co., Wilmington, N. C.	Harvest King Guano	Morganton	R	5.73	2.61	8.34	.68	1.38	2.06	**2.68**				17.22
3236	Pocomoke Guano Co., Norfolk, Va.	Crescent Complete Compound	Wallace	R	6.35	1.87	8.22	.60	1 92	2.52	3.04				19.06
3683	Va.-Car. Chemical Co., Richmond, Va.	Pilot Ammoniated Guano—Special for Tobacco.	Winston	R	5.08	1.49	**6.57**	.92	1.60	2.52	**2.93**	2.93		7.65	17.44
	Brands claiming						**8.00**			**2.75**	**2.00**				**18.47**
3416	N. C. Cotton Oil Co., Raleigh, N. C.	Raleigh Standard Guano	Pikeville	R	7.10	1.54	8.64	.58	2.32	2.90	2.15				18.71
3507	Va.-Car. Chemical Co., Richmond, Va.	Royal Crown	Nashville	S	5.95	2.15	8.10	.34	3.00	3.34	**1.90**				20.40
	Brands claiming						**8.00**			**2.75**	**2.50**				**19.02**
3295	Va.-Car. Chemical Co., Richmond, Va.	Delta	Mt. Olive	R	5.18	2.87	8.05	.32	2.95	3.27	**2.22**				20.48
3576	do	Orange Grove Guano	Mt. Olive	R	6.30	1.85	8.15	.70	1.48	2.18	**1.50**				**16.18**
	Brands claiming						**8.00**			**2.50**	**3.00**				**18.75**
3270	Bragaw, Wm., & Co., Washington, N. C	Tuckahoe Tobacco Guano	Washington	S	5.90	1.97	**7.87**	1.21	1.39	2.60	3.12	3.12		7.7	19.10
3479	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Caraleigh Special Tobacco Guano.	Springhope	R	5.68	1.56	**7.64**	.02	2.96	2.98	3.12	3.12		6.5	20.14
3578	do	Planter's Pride	Clinton	R	5.45	1.95	**7.40**	.56	2.46	3.02	3.04				19.97
3422	Eureka Fertilizer Co., Perryville, Md	Special Potato Guano	Elizabeth City	R	7.93	1.76	9.69	.92	1.20	**2.12**	3.19				19.23
3418	Farmers Guano Co., Raleigh, N. C.	Big Crop Guano	Scotland Neck	R	6.10	1.98	8.08	.19	2.53	2.72	**2.36**				18.84
3677	do	Toco Tobacco Guano	Dunn	R	5.50	1.79	**7.29**	.24	2.40	2.64	**2.71**	2.71		5.7	18.25
3644	Meadows, E. H. & J. A., Co., New Bern, N. C.	Roanoke Guano	Hookerton	D	6.75	3.62	10.37	.96	1.54	2.50	3.40				21.32
3362	Patapsco Guano Co., Baltimore, Md.	Patapsco Special Tobacco Mixture.	New Bern	R	6.18	1.78	**7.96**	1.40	1.33	2.73	3.09	3.09		7.25	19.57
3268	do	Unicorn Guano	Greenville	R	5.85	2.13	**7.98**	.91	1.64	2.55	3.04				18.94
3488	Piedmont-Mt. Airy Guano Co , Baltimore, Md.	Piedmont Guano for Tobacco	Elm City	R	6.65	1.15	**7.80**	1.52	1.38	2.90	3.37	3.37		10.3	20.30

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows : N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1904—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.										
3354	Powhatan Chemical Co., Richmond, Va.	White Leaf Tobacco Fertilizer	La Grange	---	6.18	1.38	8.56	.87	2.19	3.06	3.50	3.50	---	2.95	$ 21.65
3618	Richmond Guano Co., Richmond, Va.	Tip Top Fertilizer	New Bern	S	5.93	2.81	8.74	1.11	1.11	**2.22**	**2.90**	---	---	---	**18.38**
3275	Royster, F. S., Guano Co., Norfolk, Va.	Orinoco Tobacco Guano	Williamston	S	6.78	1.42	8.20	1.32	1.22	2.54	3.06	3.06	---	7.5	19.13
3331	Va.-Car. Chemical Co., Richmond, Va.	Blue Star	Turkey	R	5.73	1.94	**7.67**	.82	1.86	2.68	3.25	---	---	---	19.33
3445	------do	Buffalo Guano	Wilson	D	5.70	1.44	**7.24**	1.10	1.76	2.86	3.04	---	---	---	19.30
3345	------do	Cooper's Special Bright Tobacco Fertilizer.	Edenton	R	4.45	2.99	**7.44**	.29	1.41	2.70	3.44	3.44	---	8.05	19.39
3245	------do	Farmers Alliance Official Guano	Washington	R	4.63	2.37	**7.00**	1.47	1.83	3.30	**2.84**	---	---	---	20.31
3314	------do	------do	Magnolia	S	5.40	2.48	**7.88**	.50	1.57	**2.07**	3.22	---	---	---	**17.47**
3365	------do	Killikinnick Tobacco Mixture	Jacksonville	S	5.15	2.29	**7.44**	.60	1.93	2.53	**2.84**	2.84	---	5.7	**18.16**
3444	------do	Osceola Tobacco Guano	Wilson	R	6.05	1.79	**7.84**	1.06	1.76	2.82	2.80	1.86	.94	1.4	19.44
3398	------do	Powers, Gibbs & Co.'s Carolina Golden Belt Guano for Tobacco.	Goldsboro	D	5.10	2.82	**7.92**	.84	1.66	2.50	**2.80**	2.80	---	5.3	18.46
3291	------do	Superlative Guano	Mt. Olive	D	5.70	2.40	8.10	.17	2.87	3.04	3.28	---	---	---	20.93
3639	------do	------do	Warsaw	R	5.48	2.11	**7.59**	.59	1.71	**2.31**	3.45	---	---	---	18.25
	Brand claiming						**8.00**			**2.00**	**4.00**				**18.20**
3517	Miller Fertilizer Co., Baltimore, Md.	Potato and Vegetable Grower	Elizabeth City	S	5.83	2.22	8.05	1.56	.60	2.16	4.29	---	---	---	19.09
	Brand claiming						**8.00**			**2.50**	**4.00**				**19.85**
3240	Navassa Guano Co., Wilmington, N. C.	Navassa Strawberry Top Dressing.	Burgaw	R	5.08	2.19	**7.27**	.85	1.96	2.81	**3.11**	---	---	---	**19.24**
	Brand claiming						**8.00**			**2.75**	**4.00**				**20.67**
3447	Va.-Car. Chemical Co., Richmond, Va.	Solid Gold Tobacco Guano	Wilson	R	6.60	1.85	8.45	.54	1.72	**2.26**	**3.55**	1.40	2.15	1.05	**18.97**
	Brands claiming						**8.00**			**3.00**	**2.00**				**19.30**
3655	Ashepoo Fertilizer Co., Charleston, S. C.	Ashepoo High Grade Ammoniated Superphosphate.	John Station	R	4.88	2.82	**7.70**	1.26	1.88	3.14	2.16	---	---	---	19.67
3831	Navassa Guano Co., Wilmington, N. C.	Navassa C. S. Meal Special 3 Per Cent Guano.	Snow Hill	R	6.00	1.91	**7.91**	.36	2.80	3.16	2.16	---	---	---	19.92
3535	Va.-Car. Chemical Co., Richmond, Va.	Special 3 Per Cent Guano	Lumberton	R	6.15	2.12	8.27	.72	2.00	**2.72**	2.53	---	---	---	**19.20**
	Brands claiming						**8.00**			**3.00**	**2.50**				**19.85**
3299	Acme Mfg. Co., Wilmington, N. C.	Acme Fertilizer	Chadbourn	D	6.30	2.23	8.53	1.14	1.89	3.03	2.50	---	---	---	20.43
3466	Va.-Car. Chemical Co., Richmond, Va.	Atlas Guano	Fremont	R	6.40	2.49	8.89	1.02	2.28	3.30	2.54	---	---	---	21.69
3467	------do	Admiral	Fremont	R	6.98	1.82	8.80	.38	1.80	**2.18**	**2.25**	---	---	---	**17 59**
3292	------do	Split Silk C. S. M. Goods	Mt. Olive	R	5.58	2.13	**7.71**	.47	2.65	3.12	2.59	---	---	---	20.08

	Brand claiming						**8.00**			**4.00**	**2.50**				**23.15**
3300	Va.-Car. Chemical Co., Richmond, Va.	Tinsley's Tobacco Fertilizer	Fair Bluff	S	5.63	2.44	8.07	.92	2.74	**3.62**	2.50	1.53	.97	1.15	21.96
	Brand claiming						**8.00**			**2.00**	**10.00**				**24.80**
3534	Armour Fert. Works, Baltimore, Md.	Armour's High Grade Potato Fertilizer.	Lumberton	R	6.90	1.57	8.47		2.50	2.50	10.24				27.14
	Brands claiming						**8.00**			**3.00**	**3.00**				**20.40**
3417	American Agricultural Chemical Co., New York.	Lazaretto Special for Tobacco and Potatoes.	Greenville	R	5.55	2.68	8.23	1.10	1.90	3.00	3.20	3.20		7.50	20.43
3518	American Fertilizer Co., Norfolk, Va.	American Eagle Guano	Warsaw	R	5.75	1.78	**7.53**	.60	2.50	3.10	3.48				20.84
3533	Armour Fert. Works, Wilmington, N. C.	Armour's Cotton Special Fertilizer.	Lumberton	R	6.28	1.51	**7.79**	.66	2.30	**2.96**	**2.91**				**19.98**
3478	Atlantic Chemical Co., Norfolk, Va.	Atlantic High Grade Tobacco Guano.	Spring Hope	S	7.35	1.49	8.84	1.44	1.52	**2.96**	**2.57**	2.57		6.8	20.55
3487	Bailey, John L., & Co., Elm City, N. C.	Fairmont Guano	Elm City	S	5.98	2.08	8.06	.78	2.84	3.62	3.53				23.08
3242	Baugh & Sons Co, Norfolk, Va.	Baugh's High Grade Tobacco Guano.	Washington	R	6.00	2.40	8.40	1.76	2.11	3.87	**2.85**	2.85		3.42	23.46
3392	------do	Grand Rapid Guano	Edenton	R	5.95	2.18	8.13	2.50	.74	3.24	3.94				22.28
3272	Bragaw, Wm., & Co., Washington, N. C.	Beaufort County Guano	Washington	R	5.58	2.54	8.12	.82	2.18	3.00	**2.79**				**20.28**
3230	Berkley Chemical Co., Norfolk, Va.	Advance Crop Grower	Faison	R	7.15	1.23	8.38	.98	2.40	3.38	3.28				22.30
3624	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Horne's Best	Creedmoor	R	6.65	1.80	8.45	.29	2.57	**2.86**	2.47				**19.76**
3340	Columbia Guano Co., Norfolk, Va.	Hyco Tobacco Guano	Plymouth	R	6.85	2.10	8.95	1.41	1.66	3.07	3.14	3.14		7.75	21.64
3667	Crow Bros., Monroe, N. C.	Crow's High Grade Blood and Fish Guano.	Monroe	S	6.43	1.61	8.04	.54	2.18	**2.72**	**2.96**				**19.47**
3717	Farmers Guano Co., Raleigh, N. C.	Golden Grade Guano	Benson	R	5.40	1.74	**7.14**	.30	2.50	**2.80**	**2.76**				**18.70**
3379	Hampton Guano Co., Norfolk, Va.	Princess Prolific Producer	Edenton	S	5.28	2.49	**7.77**	1.06	**2.22**	3.28	3.17				21.31
3350	Imperial Guano Co., Norfolk, Va.	Imperial Tobacco Guano	Washington	R	3.98	4.38	8.36	.28	2.80	3.18	3.29	3.29		3.8	21.64
3500	------do	Imperial X. L. O. Cotton Guano	Washington	S	4.75	3.46	8.21	.69	2.41	3.10	3.30				21.25
3632	MacMurphy, W. C., Co, Charleston, S. C.	Special 8-3-3 Tobacco Guano	Gastonia	R	6.60	2.15	8.75	.90	2.24	3.14	2.91	2.91		5.25	21.44
3355	Meadows, E. H. & J. A., Co., New Bern, N. C.	Meadows' Gold Leaf Tobacco Guano.	La Grange	D	5.50	3.10	8.60	1.14	2.02	3.16	3.27	.27	3.00	.2	21.76
3509	Miller Fertilizer Co., Baltimore, Md.	Standard Phosphate	Whitakers	R	5.75	3.06	8.81	2.38	1.18	3.56	**2.81**				22.77
3283	Navassa Guano Co., Wilmington, N. C.	Clarendon Tobacco Guano	Hamilton	R	4.48	2.37	**6.85**	1.18	2.10	3.28	3.38	3.38		8.06	20.70
3364	New Bern Cotton Oil Fertilizer Mills, New Bern, N. C.	Foy's High Grade Fertilizer	Jacksonville	R	7.83	1.84	9.67	.78	3.25	4.03	3.35				25.68
3377	Ober, G., & Sons Co., Baltimore, Md.	Ober's Special Compound for Tobacco.	Edenton	R	7.85	1.19	9.04	2.07	1.36	3.43	3.43	.79	2.63	.6	23.23
3256	Patapsco Guano Co., Baltimore, Md.	Choctaw Guano	Greenville	R	5.45	2.35	**7.80**	.81	2.39	3.20	**2.87**				20.74
3303	Pocomoke Guano Co., Norfolk, Va.	Harvey's High Grade Monarch	Fair Bluff	S	7.10	1.34	8.44	.92	2.13	3.05	3.37				21.37
3253	------do	Monarch Tobacco Grower	La Grange	S	5.13	2.17	**7.30**	.74	2.60	3.34	3.27	3.27		8.22	21.19
3359	Powhatan Chemical Co, Richmond, Va.	P. C. Co.'s Hustler	Kinston	R	6.60	2.07	8.67	.54	2.04	**2.58**	4.05				22.00
3673	Reidsville Fert. Co., Reidsville, N. C.	Royal Fertilizer	Reidsville	S	5.43	2.25	**7.68**	.52	2.56	3.08	**2.91**				**20.27**
3352	Richmond Guano Co., Richmond, Va.	Gilt Edge Fertilizer	Washington	R	6.08	2.05	8.13	1.25	2.27	3.52	3.37				22.64
3710	------do	------do		D	6.80	2.02	8.82	1.12	2.32	3.44	3.04				22.63
3244	------do	Farmers' Friend High Grade Fertilizer.	Washington	R	4.48	2.38	**6.86**	1.71	2.01	3.72	3.07				21.83
3544	Royster, F. S., Guano Co., Norfolk, Va.	Bonanza Tobacco Fertilizer	Edenton	R	6.40	1.84	8.24	1.68	1.12	**2.80**	3.20	3.20		8.65	20.18
3771	------do	Marlboro High Grade Cotton Grower.	Jackson	R	6.40	1.61	8.01	1.32	1.68	3.00	3.07				20.49
3597	------do	------do	Raeford	R	6.30	1.99	8.29	1.62	1.40	3.02	**2.96**				20.68

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1904—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.										
3463	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's A. A.	Wilson	R	6.85	1.57	8.42	1.52	1.66	3.18	**2.33**	----	--	---	$ 20.64
3237	------do	Amazon High Grade Manure	Wallace	R	5.28	2.41	**7.69**	.97	1.77	**2.74**	**1.75**	---	---	--	**17.89**
3637	------do	------do	Faison	R	6.30	3.05	9.35	.70	1.10	**1.80**	**2.77**	----	----	----	**17.40**
3343	------do	Bright Leaf Tobacco Grower	Hamilton	R	4.43	3.02	**7.45**	1.10	1.56	**2.66**	3.45	3.45	----	5.05	**19.28**
3461	------do	Dunnington's Special Formula for Tobacco.	Wilson	R	5.03	2.56	**7.59**	1.28	1.64	**2.92**	3.80	3.12	.78	2.35	20.79
3501	------do	Farmers' Friend Special Tobacco Fertilizer.	Washington	R	5.25	2.43	**7.68**	2.46	1.22	3.68	3.15	1.73	1.42	1.3	22.56
3326	------do	Golden Leaf Bright Tobacco Guano.	Faison	R	5.88	1.79	**7.67**	.52	1.94	**2.46**	4.93	4.93	----	5.15	20.45
3315	------do	Gold Medal Brand Guano	Magnolia	R	5.58	2.07	**7.65**	.67	2.03	**2.70**	**2.26**	----	----	----	18.28
3689	------do	Old Dominion Guano Co.'s High Grade Fertilizer.	Raleigh	S	4.78	2.89	**7.67**	.60	2.02	2.82	**1.47**	----	----	----	**17.83**
3231	------do	Owl Brand Guano for Tobacco	Faison	D	6.53	2.16	8.69	1.27	2.01	3.28	3.05	2.09	.96	1.57	22.00
3555	------do	Powers, Gibbs & Co.'s Old Kentucky H. G. Tobacco Mixture.	Grifton	R	5.08	2.21	**7.29**	1.76	1.26	3.02	3.38	2.53	.85	1.9	20.25
3643	------do	------do	Grifton	S	5.05	2.05	**7.10**	1.88	1.20	3.08	3.31	1.86	1.45	1.4	20.20
	Brands claiming						**8.00**			**3.00**	**4.00**	----	----	----	**21.50**
3668	Crow Bros., Monroe, N. C.	Crow's Special High Grade Cotton Grower.	Monroe	R	7.68	1.76	9.44	.46	2.26	**2.72**	4.54	----	----	----	22.47
3432	Va.-Car. Chemical Co., Richmond, Va.	Groom's Special Tobacco Fertilizer.	Fremont	R	6.40	1.56	**7.96**	.69	2.58	3.27	**3.87**	.66	3.21	.5	22.21
	Brand claiming						**8.00**			**3.50**	**7.50**	----	----	----	**27.00**
3545	Camp, W. H., Petersburg, Va.	Camp's Prepared Chemicals	Edenton	R	5.70	2.73	8.43	3.09	.36	4.45	8.53	----	----	----	31.65
	Brands claiming						**8.00**			**3.00**	**10.00**	----	----	----	**28.10**
3616	Baugh & Sons Co., Norfolk, Va.	Baugh's Fruit and Berry Grower.	Clarkton	R	1.65	5.72	**7.37**	1.98	.90	**2.88**	**9.74**	----	----	----	**26.85**
3234	------do	------do	Wallace	D	1.73	5.62	**7.35**	2.21	1.30	3.51	**9.62**	----	----	----	28.78
	Brands claiming						**8.00**			**4.00**	**4.00**	----	----	----	**24.80**
3465	Acme Mfg. Co., Wilmington, N. C.	Quick Step Fertilizer	Fremont	D	6.35	1.79	8.14	2.60	1.76	4.36	4.24	----	----	----	26.38
3518	Miller Fertilizer Co., Baltimore, Md.	Miller's Irish Potato Guano	Elizabeth City	R	6.58	2.11	8.69	2.52	1.42	**3.94**	4.38	----	----	----	25.64
3563	Royster, F. S., Guano Co., Norfolk, Va.	Truckers Delight	Concord	R	5.75	1.74	**7.49**	2.85	1.25	4.09	4.29	----	----	----	24.96

	Brand claiming						8.00			4.50	4.00					26.44
3577	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Star Brand Vegetable Guano	Clinton	R	6.53	2.27	8.80	.68	1.70	2.38	3.97					20.15
	Brand claiming						8.00			4.00	5.00					25.90
3654	Va.-Car. Chemical Co., Richmond, Va.	Powers, Gibbs & Co.'s Truck Farmer Special.	Parkton	R	4.73	2.37	7.10	1.89	1.56	3.45	5.48					23.80
	Brand claiming						8.00			4.00	7.00					28.10
3497	Lister's Agricultural Chemical Co., Newark, N. J.	Lister's Potato Manure	South Mills	S	6.13	1.99	8.12	2.30	2.22	4.52	7.52					30.50
	Brand claiming						8.00			5.00	3.00					27.00
3342	Va.-Car. Chemical Co., Richmond, Va.	Special Plant and Truck Fertilizer.	Edenton	R	4.68	2.64	7.32	1.82	2.62	4.44	3.31					24.15
	Brands claiming						8.00			5.00	5.00					29.20
3378	Va.-Car. Chemical Co., Richmond, Va.	Virginia Trucker	Elizabeth City	R	4.78	2.52	7.30	3.05	2.10	5.15	6.07					30.24
3332	------do	----do	Faison	R	4.70	1.81	6.51	.31	5.82	6.13	5.07					31.67
3344	------do	Norfolk Truck and Tomato Grower.	Edenton	R	4.45	2.62	7.07	1.82	2.42	4.24	5.43					26.33
	Brand claiming						8.00			5.00	6.00					30.30
3429	Upshur, R. L., Norfolk, Va.	Upshur's Farmers' Favorite Guano.	Edenton	S	6.10	2.04	8.14	1.74	2.96	4.70	6.66					30.16
	Brand claiming						8.00			5.00	7.00					31.40
3563	Armour Fertilizer Works, Baltimore, Md.	Armour's Bone, Blood and Potash Fertilizer.	Lumber Bridge	R	8.03	.76	8.79	2.72	2.52	5.24	7.61					33.58
	Brand claiming						8.00			7.00	6.00					36.90
3387	Upshur, R. L., Norfolk, Va.	Upshur's Farmers' Challenge Guano.	Edenton	R	4.80	2.22	7.02	3.24	3.60	6.84	6.77					36.34
	Brands claiming						8.50			2.00	2.00					16.45
3541	Pocomoke Guano Co., Norfolk, Va.	Electric Crop Grower	Elizabeth City	S	6.10	2.46	8.56	.16	1.90	2.06	2.19					16.91
3271	------do	Pocomoke Superphosphate	Washington	R	6.20	1.97	8.17	.77	1.35	2.12	2.13					16.69
	Brand claiming						8.50			2.75	2.00					18.93
3462	Va.-Car. Chemical Co., Richmond, Va	Allison & Addison's Anchor Brand Tobacco Fertilizer.	Wilson	R	6.95	2.27	9.22	1.44	1.88	3.32	2.45	.86	1.59	.65		21.95
	Brands claiming						9.00			2.00	2.00					16.90
3249	American Agricultural Chemical Co, New York.	Gold Dust Guano	Edenton	S	5.35	2.69	8.04	.61	1.72	2 33	2.03					17.16
3707	------do	Gold Dust Guano	Williamston	R	5.13	2.34	7.47	.42	1.78	2.20	2.18					16.34
3564	Ober, G., & Sons, Baltimore, Md.	Ober's Special Ammoniated Dissolved Bone.	Concord	R	8.48	1.17	9.65	.94	1.72	2.66	2.57					20.29
3718	Pocahontas Guano Co., Lynchburg, Va.	Yellow Tobacco Special	Kernersville	D	6.68	2.02	8.70	.52	1.82	2.34	2.62	.20	2.42	.15		18.43
3587	Va.-Car. Chemical Co., Richmond, Va.	Durham's Fertilizer Company's Standard Guano.	Waco	R	5.30	2.74	8.04	.38	1.88	2.26	1.75					16.62
	Brand claiming						8.50			2.50	2.50					18.65
3508	Pocomoke Guano Co., Norfolk, Va.	Cinco Tobacco Guano	Whitakers	R	5.90	2.77	8.67	.22	2.50	2.72	2.61	2.61		6.35		19.65
	Brands claiming						9.00			2.25	1.00					16.63
3575	Bradley Fertilizer Co., Boston, Mass.	Sea Fowl Guano	Mt. Olive	R	4.25	4.41	8.66	1.14	1.46	2.60	1.34					17.85
3586	Quinnipiac Co, New York	Quinnipiac Pine Island Ammoniated Superphosphate.	Mooresville	R	4.08	4.62	8.70	1.40	1.04	2.44	1.33					17.25
	Brands claiming						9.00			2.50	2.00					18.55
3504	Va.-Car. Chemical Co., Richmond, Va.	Charlotte High Grade Special Tobacco Fertilizer.	Enfield	R	6.30	2.59	8.89	.82	2.60	3.42	2.16	.86	1.30	.65		21.66

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1904—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.										
3448	Va -Car. Chemical Co., Richmond, Va.	Eureka Ammoniated Bone Special for Tobacco.	Wilson	R	6.98	1.49	**8.47**	.92	1.68	2.68	2.09	2.09	----	4.2	**$18.50**
3574	------do	Owl Brand Special Tobacco Guano.	Jacksonville	S	6.13	2.31	**8.44**	.50	1.74	**2.24**	2.00	2.00	----	4.1	**17.19**
	Brands claiming						**9.00**			**2.75**	**2.00**				**19.38**
3678	Acme Mfg. Co., Wilmington, N. C.	Acme Cotton Grower	Dunn	R	6.95	1.84	**8.79**	.90	1.86	**2.76**	2.24				19.48
3399	Atlantic Chemical Co., Norfolk, Va.	Atlantic Meal Compound	Mt. Olive	R	7.90	1.51	9.41	1.14	1.86	3.00	2.66				21.29
3356	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Pacific Tobacco and Cotton Grower.	La Grange	R	5.30	2.12	**7.42**	.70	3.15	3.85	2.59	2.59	----	4.85	22.23
3311	Columbia Guano Co., Norfolk, Va.	Columbia Cotton-seed Meal Special.	Mt. Olive	S	7.85	1.33	**8.18**	1.10	1.90	3.00	2.05				19.52
3373	Imperial Co , Norfolk, Va.	Imperial Martin County Special Crop Grower.	Edenton	R	5.75	2.30	**8.05**	.78	2.40	3.18	2.35				20.33
3524	MacMurphy, W. C., Co., Charleston, S C.	Wilcox, Gibbs & Co.'s Guano	Maxton	R	8.38	1.59	9.97	.82	2.00	2.82	2.27				20.49
3349	Powhatan Chemical Co., Richmond, Va.	Economic Cotton Grower	Williamston	R	7.35	2.18	9.53	.22	2.40	**2.62**	2.23				19.68
3452	Richmond Guano Co., Richmond, Va.	Carolina Cotton Grower	Edenton	R	7.15	1.89	9.04	.90	2.04	2.94	3.24				21.40
3277	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Meal Mixture	Edenton	S	7.88	.96	**8.84**	1.13	1.79	2.92	**1.89**				19.67
3483	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Star Brand Special Tobacco Manure.	Edenton	D	6.05	2.40	**8.45**	.68	2.26	2.94	**2.40**	.80	1.60	.6	**19.95**
3247	------do	Prolific Cotton Grower	Edenton	D	5.50	1.78	**7.28**	.90	2.51	3.41	3.02				21.13
3310	------do	---do	Mt. Olive	D	6.38	2.48	8.86	.32	2.76	3.08	**1.88**				20.21
3474	------do	White Stem	Springhope	D	7.35	2.92	10.27	.84	1.82	**2.66**	2.01				20.23
	Brands claiming						**9.00**			**2.25**	**4.00**				**19.93**
3229	Berkley Chemical Co., Norfolk, Va.	Monitor Animal Bone Fertilizer	Faison	R	7.75	1.72	9.47	.96	1.74	2.70	**3.91**				21.73
3329	Pocomoke Guano Co , Norfolk, Va.	Monticello Animal Bone Fertilizer.	Clinton	S	7.70	1.59	9.29	.38	2.12	2.50	4.07				21.09
	Brands claiming						**9.00**			**8.00**	**2.00**				**20.20**
3330	Va.-Car. Chemical Co., Richmond, Va.	Cotton-seed Meal Standard Guano.	Clinton	R	6.20	2.74	**8.94**	.55	2.03	**2.58**	2.50				**19.30**
3665	Swift Fertilizer Works, Atlanta, Ga.	Swift's Cotton King	Monroe	S	5.83	3.14	**8.97**	1.26	2.26	3.52	2.16				22.06
	Brand claiming						**9.00**			**2.50**	**4.00**				**20.75**
3522	American Agricultural Chemical Co., New York.	Lazaretto Retriever	Hertford	S	7.95	1.83	9.78	.98	1.54	2.52	4.16	1.93	1.93	8.35	21.69

	Brand claiming					**9.00**			**3.50**	**5.00**						**25.15**
3442	American Fertilizer Co., Norfolk, Va.	Pitt County Special Fertilizer	Calypso	D	6.85	2.25	9.10	2.05	1.02	**3.07**	**4.92**					**23.73**
	Brand claiming						**9.25**			**2.50**	**2.00**					**18.78**
3293	Patapsco Guano Co., Baltimore, Md.	Patapsco Guano	Mt. Olive	R	6.65	1.96	**8.61**	1.05	1.81	2.86	2.75					20.21
	Brand claiming						**4.00**			**3.00**	**5.00**					**19.00**
3515	Imperial Co., Norfolk, Va.	Imperial Cubanola Tobacco Guano.	Edenton	R	4.35	2.72	7.07	.88	1.88	**2.76**	6.82	6.82		6.9		22.97
	Brand claiming						**4.00**			**4.00**	**6.00**					**23.40**
3495	Imperial Co., Norfolk, Va.	Imperial Laughinghouse Special Tobacco Guano.	Edenton	S	2.45	3.02	5.47	1.16	2.68	**3.84**	**5.76**	5.76		12.05		23.92
	Brand claiming						**5.00**			**3.50**	**4.00**					**20.40**
3347	Griffith & Boyd, Baltimore, Md.	Stable Manure Substitute	Elizabeth City	R	4.65	2.13	6.75	.52	2.86	**3.38**	**3.69**					21.32
	Brand claiming						**5.00**			**5.00**	**5.00**					**26.50**
3423	Upshur, R. L., Norfolk, Va	Upshur's Five Per Cent Guano	Edenton	R	3.95	2.44	6.39	1.32	3.68	5.00	5.12					27.88
	Brands claiming						**5.00**			**7.00**	**5.00**					**33.10**
3456	Griffith & Boyd, Baltimore, Md.	Seven Per Cent Guano	Elizabeth City	R	4.75	.31	5.06	3.54	3.20	**6.74**	5.09					32.39
3388	Imperial Co., Norfolk, Va.	Imperial Special Seven Per Cent Guano.	Edenton	R	3.28	2.72	6.00	3.25	3.45	**6.70**	5.55					33.62
	Brand claiming						**5.00**			**10.00**	**2.50**					**40.25**
3241	Baugh & Sons Co., Norfolk, Va.	Baugh's New Process Ten Per Cent Guano.	Washington	R	3.82	1.65	5.48	7.73	2.47	10.20	2.77					41.64
	Brand claiming						**5.00**			**10.00**	**3.00**					**40.80**
3428	American Agricultural Chemical Co., New York.	Lazaretto's Ten Per Cent Guano.	Columbia	R	4.38	.87	5.25	3.98	5.22	**9.20**	3.78					**39.24**
	Brands claiming						**6.00**			**4.00**	**4.00**					**23.00**
3636	Home Fertilizer Chemical Works, Baltimore, Md.	Home Potato Grower	Wallace	S	3.90	2.87	6.77	2.06	.72	**2.78**	**3.96**					**19.62**
3441	Tuscarora Fertilizer Co., Wilmington, N. C.	Tuscarora Manure Substitute	Calypso	R	4.98	1.16	6.14	2.00	1.54	**3.54**	4.57					**22.21**
3313	Va.-Car. Chemical Co, Richmond, Va.	Tinsley's Strawberry Grower	Mt. Olive	R	4.16	1.91	6.07	1.12	3.21	4.33	4.20					24.37
	Brand claiming						**6.00**			**4.00**	**8.00**					**27.40**
3298	Acme Mfg. Co., Wilmington, N. C.	Acme Truck Grower	Chadbourn	R	4.98	1.73	6.71	2.89	1.12	4.01	8.39					28.50
	Brands claiming						**6.00**			**5.00**	**5.00**					**27.40**
3384	Baugh & Sons Co., Norfolk, Va.	Baugh's 5-6-5 Guano	Elizabeth City	R	3.80	1.17	**4.97**	1.78	3.50	5.28	5.14					27.55
3279	------do	------do	Elizabeth City	R	2.58	4.09	6.67	2.24	2.18	**4.42**	**3.83**					**24.80**
3390	Imperial Co., Norfolk, Va.	Williams' Special Potato Guano	Hertford	R	3.53	3.17	6.70	1.74	3.48	5.22	**4.70**					28.48
	Brands claiming						**6.00**			**5.00**	**7.00**					**29.60**
3319	American Fertilizer Co., Norfolk, Va.	Special Potato Manure	Warsaw	R	4.20	1.42	**5.62**	.46	4.62	5.08	8.46					31.13
3233	Baugh & Sons Co., Norfolk, Va.	Peruvian Guano Substitute	Wallace	D	4.68	1.56	6.24	3.10	2.12	5.22	7.55					31.15
3421	Eureka Fertilizer Co., Perryville, Md.	Irish Potato Guano	Elizabeth City	R	6.78	3.11	9.89	1.98	1.90	**3.88**	**5.48**					**27.73**
3455	Griffith & Boyd, Baltimore, Md.	Accomac Trucker	Elizabeth City	S	5.60	1.45	7.05	.96	3.50	**4.46**	**5.89**					**27.52**
3434	Imperial Co., Norfolk, Va.	Imperial Potato Guano	Elizabeth City	S	4.58	1.83	6.41	2.20	2.74	**4.94**	7.13					29.92
3383	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Early Vegetable Manure.	Elizabeth City	R	3.75	1.52	**5.37**	2.12	2.10	**4.22**	10.60					30.24
	Brand claiming						**6.00**			**7.00**	**5.00**					**34.00**
3259	American Agricultural Chemical Co., New York.	Lazaretto Truckers' Favorite	Washington	R	4.13	1.81	**5.94**	2.29	4.88	7.17	5.31					34.85
3338	Pocomoke Guano Co., Norfolk, Va.	Freeman's Seven Per Cent Irish Potato Grower.	Elizabeth City	R	4.68	1.73	6.41	2.84	3.98	**6.82**	5.14					**33.93**
3339	------do	Seaboard Popular Trucker	Elizabeth City	S	4.60	1.75	6.35	3.11	3.79	**6.90**	5.28					34.29

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1904—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.										
	Brand claiming						**6.00**			**5.50**	**7.00**				**$31.25**
3519	Miller Fertilizer Co., Baltimore, Md.	High Grade Potato	Elizabeth City	S	4.98	1.41	6.49	2.32	3.38	5.70	**6.24**				31.52
	Brand claiming						**6.00**			**6.00**	**6.00**				**31.80**
3425	Va.-Car. Chemical Co, Richmond, Va.	Tinsley's Irish Potato Guano	Winfall	R	4.18	1.12	**5.30**	2.04	4.22	6.26	6.20				32.58
	Brand claiming						**6.50**			**2.00**	**4.50**				**17.50**
3543	Griffith & Boyd, Baltimore, Md.	Sweet Potato Guano	Elizabeth City	S	5.88	1.47	7.35	.16	1.96	2.12	4.53				18.60
	Brand claiming						**7.00**			**4.00**	**4.00**				**23.90**
3547	American Agricultural Chemical Co., New York.	Special Manure for Potatoes and Truck.	Edenton	R	6.15	2.10	8.25	1.54	2.44	**3.98**	**3.72**				24.65
	Brand claiming						**7.00**			**4.50**	**6.00**				**27.75**
3696	Patapsco Guano Co., Baltimore, Md	Money Maker Guano	Greenville	R	5.43	2.24	7.67	2.08	2.30	4.38	**5.94**				27.89
	Brands claiming						**7.00**			**5.00**	**5.00**				**28.30**
3419	American Agricultural Chemical Co., New York.	Lazaretto Early Trucker	Hassell	R	5.38	1.51	**6.89**	2.71	2.83	5.54	5.33				30.35
3261	----- do	Zell's Truck Grower	Washington	R	5.23	1.84	7.07	2.09	3.00	5.09	5.58				29.30
3391	Arps, Geo. L., Norfolk, Va.	Arps' Potato Guano	Edenton	R	1.13	5.85	**6.98**	2.10	2.02	**4.12**	**3.65**				**23.89**
3380	Columbia Guano Co., Norfolk, Va.	Columbia Potato Guano	Edenton	S	5.63	1.66	7.29	2.60	2.82	5.42	**4.67**				29.58
3228	Patapsco Guano Co., Baltimore, Md.	Patapsco Trucker for Early Vegetables.	Faison	R	5.48	1.72	7.20	2.45	3.19	5.64	5.15				30.76
3658	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Potato Guano	Edenton	S	5.58	1.89	7.47	3.54	.98	**4.52**	4.44				**26.52**
	Brands claiming						**7.00**			**5.00**	**7.00**				**30.50**
3251	Navassa Guano Co., Wilmington, N. C.	Navassa Root Crop Fertilizer	Elizabeth City	R	3.75	2.69	**6.44**	1.99	2.71	**4.76**	7.70				**29.78**
3520	New Bern Cotton Oil and Fertilizer Works, New Bern, N. C.	Ives' Irish Potato Guano	Elizabeth City	S	6.15	1.37	7.52	2.12	2.88	5.00	7.33				31.33
	Brands claiming						**7.00**			**5.00**	**8.00**				**31.60**
3258	American Agricultural Chemical Co., New York.	Pamlico Trucker	Washington	R	5.25	1.80	7.05	2.13	3.00	5.13	8.38				32.49
3521	Imperial Co., Norfolk, Va.	Imperial High Grade Irish Potato Guano.	Elizabeth City	R	4.05	2.59	**6.64**	1.90	2.50	**4.40**	**7.72**				**28.98**
3551	Meadows, E. H. & J. A., Co., New Bern, N. C.	Meadows' Great Potato Guano	La Grange	R	4.48	2.54	7.02	2.08	2.72	**4.80**	8.09				31.06
3285	Va.-Car. Chemical Co., Richmond, Va.	Old Dominion Potato Manure	Hertford	R	3.80	2.75	**6.55**	1.39	3.47	**4.86**	9.12				31.97

	Brand claiming					**7.00**			**6.00**	**5.00**				**31.60**
3351	Richmond Guano Co., Richmond, Va.	Special High Grade for Truck	Washington	R	5.63	1.94	7.57	1.89	4.62	6.51	5.83				34.71
	Brand claiming						**7.00**			**7.00**	**5.00**				**34.90**
3304	American Fertilizer Co., Norfolk, Va.	Standard Seven Per Cent Ammonia Guano.	Elizabeth City	R	3.85	3.04	**6.89**	1.74	4.88	**6.62**	6.37				35.06
	Brands claiming						**7.00**			**7.00**	**7.00**				**37.10**
3697	American Agricultural Chemical Co., New York.	Roberson's Special Potato Guano.	Robersonville	R	5.50	1.54	7.04	3.71	2.91	**6.62**	7.34				**36.26**
3257	Patapsco Guano Co., Baltimore, Md.	Patapsco Truck Guano	Greenville	D	4.83	1.93	**6.76**	3.22	3.80	7.02	7.50				37.50
3367	Va.-Car. Chemical Co., Richmond, Va.	Best Potato Manure	Polloksville	R	5.23	1.08	**6.31**	2.44	3.92	**6.36**	9.04				**36.64**
3698	------do	Old Dominion 7-7-7 Truck Guano	Robersonville	R	5.33	1.66	**6.99**	3.10	2.60	**5.70**	7.06				**32.87**
	Brand claiming						**10.00**			**3.00**	**10.00**				**29.90**
3525	American Agricultural Chemical Co., New York.	Young's Melon Fertilizer	Laurinburg	R	7.23	2.82	10.05	1.90	1.44	3.34	10.21				31.25
	Brand claiming						**11.00**			**3.00**	**4.00**				**24.20**
3669	Va.-Car. Chemical Co., Richmond, Va.	Oliver's Perfect Wheat Fertilizer	Charlotte	R	7.98	3.32	11.30	2.00	.66	**2.66**	**3.40**				**22.68**
	Brand claiming						**8.00**				**2.00**				**9.40**
3675	Reidsville Fertilizer Co., Reidsville, N. C.	Bone and Potash	Reidsville	R	4.75	2.62	**7.37**				2.72				9.60
	Brand claiming						**8.00**				**2.25**				**9.68**
3608	Navassa Guano Co., Wilmington, N. C.	Warlick's Mixture	Newton	R	7.90	2.97	10.87				**1.63**				11.58
3602	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's McGavock's Special Potash Mixture.	Hickory	R	2.95	4.37	**7.32**				**2.19**				**9.00**
	Brands claiming						**8.50**				**2.00**				**9.85**
3567	Va.-Car. Chemical Co., Richmond, Va.	Old Dominion Dissolved Bone and Potash.	High Point	R	3.20	4.29	**7.49**				**1.71**				**8.62**
3676	------do	Va. State Fert. Co.'s Gilt Edge Dissolved Bone and Potash.	Reidsville	R	2.83	5.70	8.53				**1.38**				**9.19**
	Brands claiming						**10.00**				**1.00**				**10.10**
3592	Navassa Guano Co., Wilmington, N. C.	Navassa Acid Phosphate with Potash.	Lincolnton	D	5.45	4.31	**9.76**				.87				**9.74**
3684	Va.-Car. Chemical Co , Richmond, Va.	Quick Step Soluble Bone and Potash.	Winston	D	5.15	3.82	**8.97**				.71				**8.86**
	Brand claiming						**10.00**				**1.50**				**10.65**
3593	Va.-Car. Chemical Co., Richmond, Va.	Great Wheat and Corn Grower	Iron Station	D	5.08	4.70	**9.78**				**1.11**				**10.02**
	Brands claiming						**10.00**				**2.00**				**11.20**
3702	Acme Mfg Co., Wilmington, N. C.	Acme Bone and Potash	Roseboro	R	6.55	3.19	**9.64**				2.55				11.48
3458	American Fertilizer Co., Norfolk, Va.	Dissolved Bone and Potash for Corn and Wheat.	Edenton	D	5.88	3.63	**9.51**				**1.88**				**10.63**
3581	------do	Dissolved Bone and Potash Guano.	Clinton	R	6.43	2.65	**9.08**				2.10				10.48
3685	Atlantic Chemical Co., Norfolk, Va.	Atlantic Bone and Potash Mixture.	Greensboro	D	6.10	4.16	10.26				**1.53**				**10.92**
3437	Baugh & Sons Co., Norfolk, Va.	Baugh's Soluble Alkaline Superphosphate.	Elizabeth City	D	10.93	2.38	13.31				**1.59**				13.73
3568	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Electric Bone and Potash Mixture.	High Point	R	5.55	3.09	**8.64**				2.21				**10.21**
3556	Columbia Guano Co., Norfolk, Va.	Columbia Bone and Potash Mixture.	La Grange	D	7.60	2.44	10.04				2.06				11.30
3661	------do	----do	King's Mtn	R	5.90	4.10	10.00				**1.82**				11.00

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1904—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.										
3620	Farmers' Guano Co., Raleigh, N. C.	Century Bone and Potash Mixture.	Statesville	R	7.15	4.07	11.22	----	----	----	2.80	----	----	----	$ 13.18
3498	Imperial Company, Norfolk, Va.	Imperial Bone and Potash	Edenton	D	11.03	1.71	12.74	----	----	----	**1.21**	----	----	----	12.80
3617	Meadows, E. H. & J. A., Co., New Bern, N. C.	Meadows' Dissolved Bone and Potash.	Trenton	R	7.85	2.22	10.07	----	----	----	2.05	----	----	----	11.32
3705	Navassa Guano Co., Wilmington, N. C.	Navassa Dissolved Bone and Potash.	Autryville	R	7.43	2.94	10.37	----	----	----	**1.42**	----	----	----	10.90
3368	Patapsco Guano Co., Baltimore, Md.	Patapsco Soluble Bone and Potash.	New Bern	D	6.55	3.20	**9.75**	----	----	----	2.25	----	----	----	11.25
3612	Powhatan Chemical Co., Richmond, Va.	Bone and Potash Mixture	Chapanoke	R	6.35	3.96	10.31	----	----	----	**1.70**	----	----	----	**11.15**
3629	Richmond Guano Co., Richmond, Va.	Bone and Potash Mixture	Burlington	S	5.18	4.76	**9.94**	----	----	----	**1.53**	----	----	----	**10.63**
3580	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Bone and Potash Mixture.	Faison	R	7.80	2.76	10.56	----	----	----	**1.67**	----	----	----	11.34
3558	Va.-Car. Chemical Co, Richmond, Va	Atlantic and Virginia Fertilizer Co.'s Eureka Bone and Potash Compound.	Mooresville	R	5.70	4.70	10.01	----	----	----	**1.31**	----	----	----	10.45
3649	----do	B. P. Potash Mixture	Lenoir	R	6.58	4.26	10.84	----	----	----	**1.09**	----	----	----	**10.95**
3625	----do	Capital Bone and Potash Compound.	Durham	D	5.28	4.81	10.09	----	----	----	**1.42**	----	----	----	**10.64**
3559	----do	Durham Fertilizer Co.'s Bone and Potash Mixture.	Mooresville	R	2.98	5.76	**8.74**	----	----	----	**1.87**	----	----	----	**9.92**
3405	----do	H. G. Alkaline Bone and Potash	Goldsboro	D	7.30	2.37	**9.67**	----	----	----	**1.86**	----	----	----	**10.75**
3566	----do	Mammoth Corn Grower	Salisbury	D	5.58	4.23	**9.81**	----	----	----	**1.72**	----	----	----	**10.72**
3579	----do	Norfolk Bone and Potash	Mt. Olive	R	8.23	2.49	10.72	----	----	----	3.11	----	----	----	13.07
3663	----do	Owl Brand Acid Phosphate with Potash.	Mocksville	R	3.35	5.05	**8.40**	----	----	----	**1.45**	----	----	----	**9.16**
3703	----do	Powers, Gibbs & Co.'s Dissolved Bone and Potash.	Roseboro	S	7.08	3.46	10.54	----	----	----	**1.21**	----	----	----	**10.81**
3704	----do	Winston Bone and Potash Compound.	Roseboro	R	7.33	2.68	10.01	----	----	----	2.24	----	----	----	11.47
3719	----do	Tinsley's Bone and Potash Mixture.	Kernersville	D	3.78	6.79	10.57	----	----	----	**1.76**	----	----	----	11.45
	Brands claiming						**10.00**	----	----	----	**3.00**	----	----	----	**12.30**
3720	Va.-Car. Chemical Co., Richmond, Va.	Diamond Wheat Manure	Guilford Col'ge	D	3.78	4.68	**8.46**	----	----	----	**2.84**	----	----	----	**10.74**

3590	Va.-Car. Chemical Co., Richmond, Va.	Planters' Bone and Potash Mixture.	Cherryville	R	6.73	4.29	10.82				2.00				11.94
	Brands claiming						10.00				4.00				13.40
3674	Reidsville Fertilizer Co , Reidsville, N. C.	Bone and Potash	Reidsville	R	6.10	3.05	9.15				2.25				10.71
3591	Va.-Car. Chemical Co., Richmond, Va.	Special Potash Mixture	Cherryville	R	6.50	3.87	10.37				2.83				12.45
3648	------do	Winner Grain Mixture	Lenoir	R	5.43	2.46	8.79				3.21				11.44
	Brand claiming						11.00				2.00				12.10
3420	Pocomoke Guano Co., Norfolk, Va.	Alkali Bone	Parmele	D	7.65	3.09	10.74				2.36				12.36
	Brand claiming						11.00				5.00				15.40
3491	Patapsco Guano Co., Baltimore, Md.	Patapsco High Grade Bone and Potash.					12.24				4.95				16.44
	Brands claiming						12.00				3.00				14.10
3628	Va.-Car. Chemical Co., Richmond, Va.	Battle's Crop Grower	Burlington	R	6.48	4.42	10.90				2.61				12.68
3569	------do	Reaper Grain Application	Concord	R	6.45	4.75	11.20				2.60				12.94
	Brand claiming						5.00			9.00					34.20
3534	Bell, Westbrook & Jurney, Beaufort, N. C.	Ground Fish	Mt. Olive	B	.53	4.39	4.92	1.44	8.00	9.44					35.58
	Brand claiming						12.00			2.00					17.40
3640	Home Fertilizer Chemical Works, Baltimore, Md.	Boykin's Dissolved Animal Bone.	Wallace	R	6.73	5.40	12.13	.84	1.34	2.18					18.11
	Brand claiming						13.00			2.50					19.95
3681	Baugh & Sons Co., Norfolk, Va.	Baugh's Pure Dissolved Animal Bone.	Winston	R	1.68	11.38	13.06	1.62	1.34	2.96					21.50
	Brand claiming									7.00	7.00				30.80
3641	Home Fertilizer Chemical Works, Baltimore, Md.	Home Fertilizer	Wallace	R						6.56	8.76				31.28
	Brand claiming									9.00	2.50				32.45
3642	Home Fertilizer Chemical Works, Baltimore, Md.	Cerealite Top Dressing	----do	S						9.00	3.04				33.04

Raw or Unmixed Fertilizer Materials.

	Brands claiming						10.00								8.00
3631	Richmond Guano Co., Richmond, Va.	Old Homestead Dissolved Bone	Burlington	S	5.58	4.60	10.18								8.14
3663	Va.-Car. Chemical Co., Richmond, Va.	Durham Acid Phosphate	Mocksville	R	4.70	5.57	10.27								8.22
	Brands claiming						12.00								9.60
3630	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Staple Acid Phosphate	Burlington	R	4.68	5.14	9.92								7.94
3523	Columbia Guano Co., Norfolk, Va.	Columbia Acid Phosphate	Edenton	R	8.33	3.71	12.04								9.63
3645	Navassa Guano Co , Wilmington, N. C.	Navassa Acid Phosphate	Rose Hill	R	9.00	3.05	12.05								9.64
3531	Royster, F. S., Guano Co., Norfolk, Va.	Royster's XX Acid Phosphate	Cornelius	N	7.60	4.53	12.13								9.70
3682	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Standard Acid Phosphate.	Centerville	R	5.75	6.22	11.97								9.59
3548	------do	Royster's High Grade Acid Phosphate.	Hertford	N	9.10	3.69	12.79								10.23
3634	------do	Travers' Dissolved S. C. Bone	Harden	R	6.58	4.90	11.48								9.18

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1904—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
	RAW OR UNMIXED FERTILIZER MATERIALS.														
	Brands claiming						**13.00**								**$10.40**
3469	Acme Mfg. Co., Wilmington, N. C.	Acme Acid Phosphate	Fremont	N	11.28	2.24	13.52								10.82
3287	American Fertilizer Co., Norfolk, Va.	Eagle High Grade Acid Phosphate.	Elizabeth City	D	10.38	3.50	13.88								11.10
3572	Armour Fert. Works, Baltimore, Md.	Armour's Acid Phosphate	Concord	R	10.63	2.41	13.04								10.43
3596	Ashepoo Fertilizer Co., Charleston, S. C.	Ashepoo XXX Acid Phosphate	Mt. Holly	R	10.48	4 08	14.56								11.65
3686	Atlantic Chemical Co., Norfolk, Va.	Atlantic High Grade Dissolved Bone.	Greensboro	D	10.55	2.89	13.44								10.75
3662	Bradley Fertilizer Co., Charleston, S. C.	Bradley's XXX Acid Phosphate.	Shelby	R	10.93	3.64	14.57								11.66
3751	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Sterling High Grade Acid Phosphate.	High Point	D	8.03	4.52	**12.55**								**10.04**
3627	Columbia Guano Co., Norfolk, Va.	Columbia High Grade Dissolved Bone.	Chapel Hill	S	10.80	2.30	13.10								10.48
3670	Crow Brothers, Monroe, N. C.	Crow Brothers High Grade Acid Phosphate.	Monroe	S	10.68	3.35	14.03								11.22
3594	Etiwan Fertilizer Co., Charleston, S. C.	Diamond Soluble Bone	Mooresville	D	9.93	2.96	**12.89**								**10.31**
3309	Navassa Guano Co., Wilmington, N. C.	Navassa High Grade Dissolved Bone.	Whiteville	R	10.00	3.10	13.10								10.48
3471	Powhatan Chem. Co., Richmond, Va.	Powhatan Acid Phosphate	Fremont	N	10.45	2.54	**12.99**								**10.39**
3694	Richmond Guano Co., Richmond, Va.	Hunter & Dunn's Dissolved Bone.	Raleigh	D	8.25	4.73	**12.98**								10.38
3470	------do	Premium Dissolved Bone	Fremont	D	9.20	4.45	13.65								10.92
3415	Royster, F. S., Guano Co., Norfolk, Va.	Royster's H. G. Dissolved Bone	Fremont	D	9.53	2.57	**12.10**								**9.68**
3413	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's I X L Acid Phosphate.	Fremont	R	11.60	1.90	13.50								10.88
3651	------do	Charlotte Acid Phosphate	Graham	R	9.50	2.75	**12.25**								**9.80**
3560	------do	Crenshaw's Acid Phosphate	Mooresville	D	9.73	1.81	**11.54**								**9.23**
3321	------do	Double Bone Phosphate—Extra Strong.	Warsaw	R	10.65	2.68	13.33								10.66
3693	------do	Norfolk Best Acid Phosphate	Raleigh	R	9.38	3.36	**12.74**								10.19
3595	------do	Old Dominion Guano Co.'s High Grade Bone Phosphate.	Waco	N	7.68	4.54	**12.22**								**9.78**

3320	Va.-Car. Chemical Co., Richmond, Va.	Owl Brand High Grade Acid Phosphate	Mt. Olive	D	9.38	3.69	1.07								$ 10.46
3333	do	Powers, Gibbs & Co.'s High Grade Cotton Brand Acid Phosphate.	Faison	D	10.43	2.57	13.00								10.40
3406	do	do	Goldsboro	D	10.80	2.67	13.47								10.78
3335	do	Standard Dissolved S. C. Bone	Clinton	D	11.10	2.17	13.27								10.62
3626	do	Va. State Fert. Co.'s Clipper Brand Acid Phosphate.	Chapel Hill	R	7.30	4.94	**12.24**								**9.79**
3635	do	Victor High Grade Acid Phosphate.	Lowell	R	8.23	3.64	**11.87**								**9.50**
	Brands claiming						**14.00**								**11.20**
3526	Acme Mfg. Co., Wilmington, N. C.	Acme High Grade Acid Phosphate.	Maxton	N	11.60	2.37	**13.97**								**11.18**
3609	American Agricultural Chemical Co., New York.	Canton Chemical Baker's Dissolved S. C. Bone.	Catawba	R	11.08	4.25	15.33								12.26
3264	American Fertilizer Co., Norfolk, Va.	High Grade Acid Phosphate	Elizabeth City	D	11.00	3.07	14.07								11.26
3280	American Agricultural Chemical Co., New York.	Lazaretto Dissolved Bone Phosphate.	Washington	R	11.53	3.37	14.90								11.92
3582	Armour Fert. Works, Baltimore, Md.	Armour's Star Phosphate	Faison	D	11.70	1.57	**13.27**								**10.62**
3687	Atlantic Chemical Co., Norfolk, Va.	Acid Phosphate	Greensboro	R	11.25	2.50	**13.75**								**11.00**
3286	Baugh & Sons Co., Norfolk, Va.	Baugh's High Grade Acid Phosphate.	Edenton	D	13.00	2.85	15.85								12.68
3570	do	do	Salisbury	D	12.95	2.02	14.97								11.98
3549	Berkley Chemical Co., Berkley, Va.	Berkley Acid Phosphate	Pantego	D	11.83	2.84	14.67								11.74
3530	Caraleigh Phosphate and Fertilizer Works, Raleigh, N C.	Climax Dissolved Bone	Davidson	N	9.30	2.99	**12.29**								**9.83**
3438	Columbia Guano Co , Norfolk, Va.	Columbia Acid Phosphate	Davidson	D	11.95	1.69	**13.64**								**10.91**
3393	Harrell, S. B., & Co , Norfolk, Va.	Harrell's Acid Phosphate	Hertford	D	11.53	3.16	14.69								11.75
3593	Hampton Guano Co., Norfolk, Va.	Hampton Acid Phosphate	Cameron	R	11.58	2.54	14.12								11.30
3381	Home Fertilizer Chemical Works, Baltimore, Md.	High Grade Acid Phosphate	Edenton	D	12.15	1.65	**13.85**								**11.08**
3430	Imperial Company, Norfolk, Va.	Imperial High Grade Acid Phosphate.	Edenton	D	13.15	2.09	15.24								12.17
3659	Miller Fertilizer Co., Baltimore, Md.	S. C. Rock	Edenton	R	9.88	4.42	14.30								11.44
3369	New Bern Cotton Oil and Fertilizer Mills, New Bern, N. C.	Fourteen Per Cent Acid Phosphate.	Maysville	D	10.48	2.51	**12.99**								**10.39**
3492	Patapsco Guano Co., Baltimore, Md.	Patapsco Pure Dissolved S. C. Phosphate.	Elm City	D	11.50	3.15	14.65								11.72
3336	Pocomoke Guano Co., Norfolk, Va.	Peerless Acid Phosphate	Clinton	R	11.28	2.76	14.04								11.23
3439	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont High Grade S. C. Bone	Edenton	D	12.15	1.35	**13.50**								**10.80**
3614	Powhatan Chemical Co., Richmond, Va.	High Grade Acid Phosphate	Chapanoke	D	7.88	4.44	**12.32**								**9.86**
3503	Rasin-Monumental Co., Baltimore, Md.	Rasin's Acid Phosphate	Scotland Neck	N	11.08	3.29	14.37								11.50
3459	Richmond Guano Co., Richmond, Va.	High Grade Acid Phosphate	Edenton	N	9.78	3.79	**13.57**								**10.86**
3485	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Fourteen Per Cent Acid Phosphate.	Edenton	D	11.73	2.73	14.46								11.57
3712	Swift Fertilizer Works, Atlanta, Ga.	Swift's Cultivator H. G. Acid Phosphate.	Rockingham	R	10.20	3.70	**13.90**								**11.12**
3371	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Fulton Acid Phosphate	Jacksonville	D	10.70	2.69	**13.39**								**10.71**

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1904—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.										Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					RAW OR UNMIXED FERTILIZER MATERIALS.										
3711	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Fulton Acid Phosphate.	Jacksonville	R	11.48	2.41	**13.89**								**$11.11**
3334	------do	Excelsior Dissolved Bone Phosphate.	Clinton	D	11.73	2.26	**13.99**								**11.19**
3255	------do	Fourteen Per Cent Acid Phosphate.	Washington	D	9.45	4.03	**13.48**								**10.78**
3606	------do	Owl Brand Dissolved Bone	Burlington	R	7.33	4.62	**11.95**								**9.56**
3412	------do	Powhatan H. G. Phosphate	Rose Hill	D	10.65	3.00	**13.68**								**10.92**
3610	------do	Travers' Dissolved Bone Phosphate.	Catawba	D	9.25	3.79	**13.04**								**10.43**
3296	------do	V.-C. C. Co.'s Fourteen Per Cent Acid Phosphate.	Mt. Olive	R	10.63	2.82	**13.45**								**10.76**
3484	------do	Valley of Virginia Bone Phosphate.	Elizabeth City	N	9.48	3.72	**13.20**								**10.56**
	Brands claiming						**16.00**								**12.80**
3633	American Fertilizer Co., Norfolk, Va.	American H. G. Acid Phosphate	Huntersville	R	11.25	4.68	**15.93**								**12.74**
3613	Baugh & Sons Co., Norfolk, Va.	Baugh's Sixteen Per Cent Acid Phosphate.	Edenton	N	13.23	2.77	16.00								12.80
3561	Columbia Guano Co., Norfolk, Va.	Columbia H. G. Sixteen Per Cent Acid Phosphate.	Davidson	D	13.18	2.24	**15.42**								**12.34**
3414	Patapsco Guano Co., Baltimore, Md.	Florida Soluble Phosphate	Fremont	D	10.83	4.88	**15.61**								**12.49**
3482	Richmond Guano Co., Richmond, Va.	Rex Dissolved Bone Phosphate	Springhope	D	11.58	3.31	**14.89**								**11.91**
3265	Royster, F. S., Guano Co., Norfolk, Va.	Royster's High Grade Sixteen Per Cent Acid Phosphate.	Tarboro	R	15.20	1.32	16.52								13.22
3540	Va.-Car. Chemical Co , Richmond, Va.	Comet Sixteen Per Cent Acid Phosphate.	Mooresville	D	11.05	4.52	**15.57**								**12.46**
3692	------do	Va. State Fertilizer Co.'s Bull Run Acid Phosphate.	Raleigh	R	10.15	5.57	**15.72**								**12.58**
3468	------do	V.-C. C. Co.'s Sixteen Per Cent Acid Phosphate.	Wilson	D	10.75	5.05	**15.80**								**12.64**
	Brands claiming										**12.00**				**12.00**
3514	Acme Mfg. Co., Wilmington, N. C.	Pure German Kainit	Clarkton	S							12.70				12.00

3290	American Fertilizer Co., Norfolk, Va.	Genuine German Kainit	Elizabeth City	S							11.48				11.48
3450	Armour Fertilizer Works, Wilmington, N. C.	do	Faison	S							10.98				10.98
3289	Baugh & Sons Co., Norfolk, Va.	do	Edenton	S							12.06				12.06
3656	Bennett, J. H., Co., Clio, S. C.	Pure German Kainit	John Station	S							13.14				13.14
3550	Berkley Chemical Co., Norfolk, Va.	Genuine German Kainit	Pantego	S							12.20				12.20
3706	Calder Bros., Wilmington, N. C.	do	Autreyville	S							12.44				12.44
3289	Columbia Guano Co., Norfolk, Va.	do	Roper	S							11.64				11.64
3274	Imperial Guano Co., Norfolk, Va.	do	Edenton	S							11.08				11.08
3600	Hampton Guano Co., Norfolk, Va.	do	Cameron	S							12.22				12.22
3372	New Bern Cotton Oil Fertilizer Mills, New Bern, N. C.	do	Maysville	S							12.62				12.62
3440	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	do	Edenton	S							11.80				11.80
3361	Pocomoke Guano Co., Norfolk, Va.	do	Kinston	S							13.64				13.64
3615	Powhatan Chemical Co., Richmond, Va.	Pure German Kainit	Kinston	B							10.36				10.36
3460	Richmond Guano Co., Richmond, Va.	do	Edenton	S							12.24				12.24
3382	Royster, F. S., Guano Co., Norfolk, Va.	Genuine German Kainit	Edenton	S							12.50				12.50
3621	Swift Fertilizer Works, Atlanta, Ga.	Pure German Kainit	Statesville	S							12.88				12.88
3323	Va.-Car. Chemical Co., Richmond, Va.	do	Mt. Olive	S							12.26				12.26
3713	do	do	Charlotte	S							11.30				11.30
	Brands claiming										50.00				50.00
3583	Smith-Davis Co., Wilmington, N. C.	Muriate of Potash	Mt. Olive	S							47.80				47.80
3337	Va.-Car. Chemical Co., Richmond, Va.	do	Faison	R							48.84				48.84
3493	do	do	Wilson	R							48.96				48.96
	Brand claiming										48.00				48.00
3688	Royster, F. S., Guano Co., Norfolk, Va.	Muriate of Potash	Greensboro	B							48.72				48.72
	Brand claiming										2.00				2.00
3494	Lee, A. S., & Son, Richmond, Va.	Lee's Prepared Agricultural Lime.	Greensboro	R							2.10				2.10
	Brands claiming									19.00					55.10
3395	Baugh & Sons Co., Norfolk, Va.	Nitrate of Soda	Elizabeth City	B						18.72					54.24
3527	Calder Bros., Wilmington, N. C.	do	Maxton	B						18.52					53.71
3695	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	do	Raleigh	B						18.80					54.52
3599	Royster, F. S., Guano Co., Norfolk, Va.	do	Raeford	B						18.60					53.94
3528	Smith-Davis Co., Wilmington, N. C.	do	Laurinburg	B						18.76					54.40
	Brand claiming									10.00					29.00
3366	Baugh & Sons Co., Norfolk, Va.	Fine Ground Fish	Elizabeth City	R						10.10					29.29
	Brand claiming									4.50					
3499	Baugh & Sons Co., Norfolk, Va.	Baugh's Raw Bone Meal	Sunbury	R						5.00					*29.22
	Brands claiming									3.95	4.65				
3708	Mortimer, Edmund, & Co., New York	Genuine Peruvian Guano	Diggs	D				1.20	2.76	3.96	4.36				†34.35
3573	do	do	Jacksonville	R				2.76	1.18	3.94	4.72				‡34.31
3715	Smith-Davis Co., Wilmington, N. C.	do	Weldon	R				2.78	1.18	3.96	4.66				**34.30

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

*Total phosphoric acid found 21.03, valued at 3½ cents per pound.
†Total phosphoric acid found 23.55, valued at 3½ cents per pound.
‡Total phosphoric acid found 23.03, valued at 3½ cents per pound.
**Total phosphoric acid found 23.30, valued at 3½ cents per pound.

II.—ANALYSES OF COTTON-SEED MEAL.

Laboratory Number.	Name and Address of Manufacturer.	Where Sampled.	Per Cent Ammonia Guaranteed.	Per Cent Ammonia Found.
3071	Battleboro Oil Mill, Battleboro, N. C.	Battleboro		8.99
3085	------do	------do		8.77
3130	------do	------do		8.40
3112	------do	------do		7.64
3184	------do	------do	8.00	**7.92**
3074	Clayton Oil Mill, Clayton, N. C.	Clayton		9.23
3096	------do	------do		8.37
3086	------do	------do		8.06
3126	------do	------do		7.52
3103	------do	------do		7.50
3097	Consumers Cotton Oil Co., Tarboro, N. C.	Williamston	8.00	**7.71**
3117	------do	Hassell	8.00	**7.90**
3119	------do	Edenton	8.00	**7.76**
3174	------do	Washington	8.00	**7.73**
3302	------do	Woodland	8.00	8.02
3180	------do	Conway	8.00	**7.64**
3146	------do	Sunbury	8.00	**7.56**
3186	------do	Hobgood	8.00	**7.26**
3037	Farmers Cotton Oil Co., Wilson, N. C.	Wilson		8.70
3073	------do	------do		8.34
3098	Havens Oil Mill, Washington, N. C.	Williamston	8.00	8.64
3116	------do	Scotland Neck	8.00	8.24
3131	------do	Greenville	8.00	8.00
3101	------do	Washington		8.34
3077	------do	------do		8.29
3114	Highland Park Mfg. Co., Rock Hill, S. C.	Charlotte		8.34
3168	N. C. Cotton Oil Co., Raleigh, N. C.	Angier	8.00	**7.86**
3078	Rowland Oil and Fertilizer Co., Rowland, N. C.	Rowland		8.34
3141	Southern Cotton Oil Co., Gastonia, N. C.	Dallas	8.00	**7.53**
3084	Springhope Cotton Oil Co., Springhope, N. C.	Springhope		8.36
3100	Tar River Oil Co., Tarboro, N. C.	Washington	8.00	8.07
3175	------do	------do	8.00	**7.88**
3164	Clayton Oil Mills, Clayton, N. C.	Pittsboro	7.50	7.50
3166	------do	Clayton	7.50	**7.34**
3187	------do	Stem	7.50	**7.20**
3107	Cotton Oil and Fiber Co., Norfolk, Va.	Edenton	7.50	8.17
3165	Dunn Oil Mills, Dunn, N. C.	Clayton	7.50	7.54
3171	------do	Benson	7.50	**7.04**
3106	Edgecombe Oil Mill, Tarboro, N. C.	------do		7.52
3156	Laurinburg Cotton Oil Co., Laurinburg, N. C.	Laurinburg	7.50	8.10
3199	Laurinburg Oil Co., Laurinburg, N. C.	Lumberton	7.50	8.12
3115	Lenoir Oil and Ice Co., Kinston, N. C.	Scotland Neck	7.50	7.96
3129	------do	Ayden	7.50	7.52
3093	------do	Kinston		8.34
3094	------do	------do		8.34
3095	------do	------do		8.17
3102	------do	------do		8.00
3122	------do	------do		7.76
3170	------do	Durham	7.50	7.76
3111	Louisburg Cotton Oil Mill, Louisburg, N. C.	Louisburg		7.52
3136	------do	Youngsville	7.50	8.18
3167	------do	McCullers	7.50	7.64
3149	N. C. Cotton Oil Co., Charlotte, N. C.	Newells	7.50	8.20
3150	------do	Greensboro	7.50	7.64
3123	N. C. Cotton Oil Co., Henderson, N. C.	Enfield	7.50	**7.41**
3135	------do	Creedmoor	7.50	7.56
3183	------do	Henderson	7.50	**7.14**
3143	N. C. Cotton Oil Co., Wilmington, N. C.	Warsaw	7.50	7.91
3176	------do	Mt. Olive	7.50	7.68
3145	------do	John Station	7.50	7.74
3154	------do	Aulander	7.50	7.80
3128	New Bern Oil and Fertilizer Mills, New Bern, N. C.	Seven Springs	7.50	8.04
3120	Oliver Refining Co., Portsmouth, Va.	Edenton	7.50	7.72
3153	Southern Cotton Oil Co., Charlotte, N. C.		7.50	7.94
3301	------do	Lumberton	7.50	7.52
3132	Southern Cotton Oil Co., Conetoe, N. C.	Greenville	7.50	7.68
3159	------do	Plymouth	7.50	7.92
3137	Southern Cotton Oil Co., Concord, N. C.	Concord	7.50	7.54
3151	------do	Greensboro	7.50	7.82
3153	Southern Cotton Oil Co., Fayetteville, N. C.		7.50	7.52
3198	------do	Jonesboro	7.50	7.80

ANALYSES OF COTTON-SEED MEAL—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Where Sampled.	Per Cent Ammonia Guaranteed.	Per Cent Ammonia Found.
3152	Southern Cotton Oil Co., Gibson, N. C.		7.50	8.00
3108	Southern Cotton Oil Co., Goldsboro, N. C.	Goldsboro	7.50	7.59
3162	------do	Mt. Olive	7.50	8.55
3177	Southern Cotton Oil Co., Rocky Mount, N. C.	Rocky Mount	7.50	7.50
3124	------do	Whitakers	7.50	7.68
3099	Southern Cotton Oil Co., Tarboro, N. C.	Robersonville	7.50	7.96
3121	------do	Palmyra	7.50	7.57
3160	------do	Tarboro	7.50	7.74
3182	------do	Hobgood	7.50	7.58
3181	------do	Rich Square	7.50	7.42
3142	Statesville Oil and Fertilizer Co., Statesville, N. C.	Huntersville	7.50	7.82
3169	------do	Mt. Gilead	7.50	8.06
3118	Virginia-Carolina Chemical Co., Richmond, Va.	Edenton	7.50	7.80

III.—FERTILIZER BRANDS REGISTERED FOR 1904.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
The Armour Fertilizer Works, Baltimore, Md.—			
13 Per Cent Phosphate	13	..	..
Star Phosphate	14	..	..
16 Per Cent Acid Phosphate	16	..	..
17 Per Cent Acid Phosphate	17	..	..
Phosphate and Potash No. 1	10	..	2
Phosphate and Potash No. 2	8	..	5
Superphosphate and Potash	10	..	4
Phosphoric Acid and Potash	10	..	5
General	8	2	2
King Cotton Grower	8	2.50	1
Armour's Champion	8	2.50	2.50
Valley Brand Tobacco	8	2	5
High Grade Potato	8	2	10
Ammoniated Bone with Potash	6	3	2
Armour's Cotton Special	8	3	3
Tobacco Special	8	3	3
All Soluble	8	3.50	4
Little Sam's Big Tobacco Grower	8	3.50	6
Manure Substitute	6	4	4
High Grade Manure for Light Soil	6	5	5
Bone, Blood and Potash	8	5	7
7 Per Cent Trucker	6	7	5
Top Dresser	5	10	2
10 Per Cent Trucker	5	10	3
Bone and Dissolved Bone with Potash	18	2	3
Bone Meal (Total)	24	3	..
Raw Bone Meal (Total)	22	4.50	..
Dried Blood	..	16.00	..
Nitrate of Soda	..	19	..
Sulphate of Potash	..	..	52
Kainit	..	..	12
Muriate of Potash	..	..	50
Truck and Berry Special	8	3	10
King Cotton No. 2	8	2.50	2
Berry King	8	2.50	4
Special Trucker	8	4	4
African Cotton Grower	9	3	3
Atlantic Chemical Co., Norfolk, Va.—			
Atlantic H. G. Tobacco Guano	8	3	3
Atlantic Tobacco Grower	8	2.50	3
Atlantic Tobacco Compound	8	2.50	2
Atlantic Cotton Grower	8	2.50	1
Atlantic Soluble Guano	8	2	2
Atlantic Special Guano	8	2	1
Atlantic Meal Compound	9	2.75	2
Atlantic 7 Per Cent Truck Guano	7	7	7
Atlantic Special Truck Guano	8	4	4
Atlantic Potato Guano	7	5	5
Atlantic Acid Phosphate	12	..	..
Atlantic H. G. Dissolved Bone	13	..	..
Atlantic 14 Per Cent Acid Phosphate	14	..	..
Atlantic H. G. 16 Per Cent Acid Phosphate	16	..	..
Atlantic Bone and Potash Mixture	10	..	2

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Genuine German Kainit	..	..	12
Nitrate of Soda	..	19	..
Sulphate of Potash	..	..	50
Muriate of Potash	..	..	48
Cotton-seed Meal	..	7.50	..
Perfection Peanut Grower	7	..	5
George L. Arps & Co., Norfolk, Va.—			
High Grade Premium Guano for Cotton, Tobacco and all Spring Crops	8	2	2
14 Per Cent Acid Phosphate	14	..	..
Kainit	..	..	12
Arps' Potato Guano	7	5	5
Acme Manufacturing Co., Wilmington, N. C.—			
Acme Fertilizer	8	3	2.50
Acme Truck Grower	6	4	8
Acme Fertilizer for Tobacco	8	3	2.50
Tip Top Tobacco Grower	8	2.50	3
Lattimore's Complete Fertilizer	8	2.50	2
Quick Step Fertilizer	8	4	4
Acme Soluble Bone	8	2.50	1
Acme Standard Guano	8	2.50	2
Gem Fertilizer	8	2	2
Acme Acid Phosphate	13	..	..
Acme Special Grain Fertilizer	8	2	2
Acme High Grade Acid Phosphate	14	..	..
Acid Phosphate	12	..	..
Nitrate of Soda	..	19	..
Pure German Kainit	..	..	12
Bone and Potash	10	..	1
Acme Bone and Potash	10	..	2
Bone and Potash	10	..	3
Bone and Potash	10	..	4
Bone and Potash	11	..	1
Bone and Potash	11	..	2
Bone and Potash	12	..	1
Bone and Potash	8	..	4
Tip Top Crop Grower	8	2.50	3
Acme Cotton Grower	9	2.75	2
Pee Dee Cotton Grower	8	3	3
Marsh's Cotton-seed Meal Guano	8	2	2
Acme Ammoniated Dissolved Bone Fertilizer	8	2	1
Ashepoo Fertilizer Co., Charleston, S. C.—			
Ashepoo Fertilizer	9	2.25	1
Ashepoo Harrow Brand Raw Bone Superphosphate	9	2	2
Ashepoo Wheat and Oat Special	9	2	1
Ashepoo XXX Guano	8.65	2	2
XXX Guano	8.50	2	2
Ashepoo Perfection Guano	8	4	6
Ashepoo Fruit Grower	8	4.75	2.75
Ashepoo High Grade Guano	8	4	4
Ashepoo Golden Tobacco Producer	8	3	3
Ashepoo X Tobacco Fertilizer	8	3	3
Ashepoo Meal Mixture	8	3	3
Ashepoo High Grade Ammoniated Superphosphate	8	3	2
Ashepoo Circle Guano	8	2.50	2
Ashepoo Guano	8	2.50	1

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Ashepoo Truck Guano	7	5	5
Ashepoo High Grade Acid Phosphate and Potash	12	..	1
Ashepoo Potash Acid Phosphate	11	..	1
Ashepoo Superpotash Phosphate	10	..	4
Ashepoo Potash Compound	10	..	3
Ashepoo XXXX Acid Phosphate	14	..	..
Ashepoo High Grade Acid Phosphate	13	..	..
Ashepoo XXX Acid Phosphate	13	..	..
Ashepoo Dissolved Bone	12	..	..
Ashepoo XX Acid Phosphate	12	..	..
Eutaw Fertilizer	9	2.25	1
Eutaw XX Guano	8.50	2	2
Eutaw Circle Guano	8	2.50	2
Eutaw Potash Acid Phosphate	11	..	1
Eutaw High Grade Acid Phosphate and Potash	12	..	1
Eutaw High Grade Acid Phosphate	13	..	..
Eutaw XX Acid Phosphate	12	..	..
Carolina Guano	8	2	2
Carolina XXX Guano	8	3	3
Carolina Acid Phosphate	13	..	..
Circle Bone	13	..	..
Palmetto Potash Acid Phosphate	11	..	1
Enoree Acid Phosphate	10	..	2
P. D. Fertilizer	8	2	1
Coomassie Acid Phosphate	12	..	..
Brownwood Acid Phosphate	8	..	4
German Kainit	..	..	12
Ashepoo Vegetable Guano	5	5	5
Coomassie Circle Fertilizer	8	2	2
Eutaw X Golden Fertilizer	8	3	4
American Fertilizer Co., Norfolk, Va.—			
American High Grade Acid Phosphate	16	..	..
High Grade Acid Phosphate	14	..	6
Eagle High Grade Acid Phosphate	13	..	..
Acid Phosphate	12	..	..
Acid Phosphate	10	..	..
Pure Dissolved Bone	14	2.50	..
Dissolved Bone and Potash for Corn and Wheat	10	..	2
Special Formula Guano for Yellow Leaf Tobacco	9	3.50	5
Pitt County Special Fertilizer	9	3.50	5
Murray's Special Fertilizer	8	3	3
J. G. Miller & Co.'s Yellow Leaf Fertilizer	8	3	3
Hadlock's High Grade Guano	8	3	3
Bob White Fertilizer for Tobacco	8	2.50	2.50
American Eagle Guano	8	3	3
A. L. Hannah's Special Formula Guano	8	2	2
American Cotton Compound	8	2	2
Bone and Peruvian Guano for Tobacco	8	2	2
Blood and Bone Compound	8	2.50	1
Peruvian Mixture	8	2	1.50
Bone and Peruvian Guano	8	2	2
American Ammoniated Bone	8	2	1
Low Grade Special Formula Guano	7	4	4
Kale, Spinach and Cabbage Guano	7	5	4
Stable Manure Substitute Guano	7	3	4
Strawberry Guano	9	3.50	9
Peruvian Mixture Guano, especially prepared for Sweet Potatoes	8	4	5
American Irish Potato Grower	7	5	5

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
American 7-7-7 for Potatoes	7	7	7
Special Potato Manure	6	5	7
Special Irish Potato Guano	8	8	6
Standard 7 Per Cent (7 per cent) Ammo. Guano	7	7	5
Ten Per Cent (10 per cent) Ammoniated Guano	7	10	2.50
Special Potato Guano	7	5	7
Bone Meal (Total)	21	3.50	..
Tankage	..	7	..
Nitrate of Soda	..	19	..
Muriate of Potash	..	..	50
Sulphate of Potash	..	..	49
Fish Scrap	..	10	..
Sulphate of Ammonia	..	25	..
Genuine German Kainit	..	..	12
Double Dissolved Bone and Potash	10	..	4
The American Agricultural Chemical Co., New York—			
Lazaretto Dissolved Bone Phosphate	14	..	..
Lazaretto Alkaline Bone Phosphate	12	..	3
Lazaretto High Grade Dis. Bone Phos. and Potash	12	..	5
Lazaretto Crop Grower	8	2	2
Lazaretto Retriever Animal Bone Fertilizer	9	2.25	4
Lazaretto Universal Compound	8	2.50	2
Lazaretto Challenge Fertilizer	8	3	3
Lazaretto Special Manure for Potatoes and Truck	7	4	4
Lazaretto Special for Tobacco and Potatoes	8	3	3
Lazaretto Early Trucker	7	5	5
Lazaretto Trucker's Favorite	6	7	5
Reese's Pacific Guano for Tobacco	8.50	3	2.50
Reese's Pacific Guano	8	2	2
Reese's Dissolved Phosphate of Lime	14	..	..
J. H. Roberson's Special Potato Guano	7	7	7
Genuine German Kainit	..	..	12
Maryland Globe Complete Manure	8	2	2
Slingluff's British Mixture	8	2.50	2.50
Clark's Orinoco Tobacco Fertilizer	8	3	4
Zell's Bright Tobacco Grower	8	3	3
Zell's Dissolved Bone Phosphate	14	..	..
Zell's Electric Phosphate	10	..	2
Zell's High Grade Potato Fertilizer	10	..	4
Zell's Ammoniated Bone Superphosphate	8	2	1
Zell's Special Compound for Tobacco	8	2	2
Zell's Calvert Guano	8	2	2
Zell's Fish Guano	8	2	2
Zell's Victoria Animal Bone Compound	9	2.25	4
Zell's Magnet	8	2.50	2
Zell's Royal High Grade Fertilizer	9	2.50	2
Zell's Reliance High Grade Manure	8	3	3
Zell's Tobacco Fertilizer	8	3	4
Zell's Special Compound for Potatoes and Vegetables,	8	3	4
Zell's Truck Grower	7	5	5
Zell's 7 Per Cent Potato and Vegetable Manure	6	7	5
Zell's 10 Per Cent Trucker	5	10	2.50
Detrick's XXtra Acid Phosphate	14	..	..
Detrick's Dissolved S. C. Bone	14	..	..
Detrick's Fish Mixture	8	2	2
Detrick's Royal Crop Grower	8	2	2
Detrick's Kangaroo Komplete Kompound	8	2	3
Detrick's Superior Animal Bone Fertilizer	9	2.25	4
Detrick's Vegetable Ammo. Bone Superphosphate	8	2.50	3

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Detrick's Special Tobacco Fertilizer	8	3	3
Detrick's Special High	8	3	3
Detrick's Quick Step Bone Phosphate	8	3	4
Detrick's Gold Eagle	6	3	6
Detrick's P. & B. Special Fertilizer	12	..	3
Detrick's Ammoniated Bone	8	2	1.50
Canton Chemical Baker's Tobacco Fertilizer	8	3	3
Canton Chemical Superior High Grade Fertilizer	8	3	3
Canton Chemical Standard High Grade Guano	8	2.50	3
Canton Chemical Animal Bone Fertilizer	9	2.25	2
Canton Chemical Baker's Fish Guano	8	2	2
Canton Chemical Game Guano	8	2	2
Canton Chemical Soluble Alkaline Bone	12	..	3
Canton Chemical Soluble Bone and Potash	10	..	2
Canton Chemical Baker's Diss. South Carolina Bone,	14	..	..
Canton Chemical Virginia High Grade Manure	8	2.50	2
Holmes & Dawson Gold Dust Guano	9	2	2
Holmes & Dawson Triumph Soluble	8	2	2
Lazaretto 10 Per Cent Guano	5	10	3
Lazaretto Dissolved Bone and Potash	10	..	2
Savage Sons & Co. Purity Guano	8	2	2
W. P. Baugham's Special Trucker	7	5	8
W. P. Baugham's Honey Pod Pride Fertilizer	8	4	5
Canton Chemical Baker's Special 7 Per Cent Guano	6	7	5
Canton Chemical Baker's Special 10 Per Cent Guano,	5	10	2.50
Canton Chemical Excelsior Trucker	7	5	5
Enterprise Alkaline Phosphate	8	..	5
Reese's Crown Phosphate Potash	11	..	2
Special Guano for Beans	8	3	7
Special Guano for Strawberries	9	5	5
Special Guano for Potatoes	8	6	8
Holmes & Dawson's Dawson Crop Maker	8	2	2
Young's Melon Fertilizer	10	3	10
Lazaretto Melon Fertilizer	10	4	5
Canton Chemical Colonial Compound	9	2	2
Lazaretto Acid Phos	14	..	..
Battleboro Oil Co., Battleboro, N. C.—			
Cotton-seed Meal	8	..	..
Baugh & Sons Co., Norfolk, Va., Philadelphia and Baltimore—			
Baugh's Cabbage Guano	6	7	5
Baugh's New Process 10 Per Cent Guano	5	10	2.50
Baugh's Fruit and Berry Guano	8	3	10
Baugh's High Grade Acid Phosphate	14	..	..
Baugh's Raw Bone Meal (warranted pure) .. (Total)	21.50	4.50	..
Baugh's Soluble Alkaline Superphosphate	10	..	2
Baugh's Peruvian Guano Substitute	6	5	7
Baugh's Fish Mixture	8	2	2
Baugh's Pure Dissolved Animal Bone	13	2.50	..
Baugh's 7 Per Cent Potato Guano	6	7	5
Baugh's High Grade Tobacco Guano	8	3	3
Baugh's High Grade Potash Mixture	10	..	4
Baugh's 16 Per Cent Acid Phosphate	16	..	..
Baugh's Animal Bone and Potash Compound for all crops	8	2	2
The Old Standby, Baugh's Raw Bone Superphosphate and Ammoniated Dissolved Animal Bone	8	2	1

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Grand Rapid Guano	8	3	3
Muriate of Potash	..	..	50
Sulphate of Potash	..	..	50
Nitrate of Soda	..	19	..
Sulphate of Potash	..	25	..
Fish Bone and Potash	7	4	4
Fine Ground Fish	..	10	..
Genuine German Kainit	..	..	12
Baugh's 5-6-5 Guano	6	5	5
Woodstock Guano	6	5	5
Mason Guano	8	2.50	3.50
Baugh Special Cotton Guano	8	2	..
Bradley Fertilizer Co., Boston, Mass., and Charleston, S. C.—			
B. D. Sea Fowl Guano	9	2.25	1
Bradley's Patent Superphosphate	9	2.25	1
Bradley's Ammoniated Dissolved Bone	8	2.25	1
Bradley's XXX Acid Phosphate	13	..	..
Bradley's Acid Phosphate	12	..	..
Bradley's Palmetto Acid Phosphate	12	..	..
Eagle Ammoniated Bone Superphosphate	8	2.25	1
German Kainit	..	..	12
The Berg Company, Philadelphia, Pa.—			
Berg's $35 Potato Manure	7	4	10
Berg's Standard Bone Manure	8	3	6
Berg's Lymph Guano for all crops	9	4	10
Berg's Vigor Volo Bone and Potash (Total)	20	4	5
Berg's Raw Bone Fine (Total)	22	5	..
Berg's Trucker's Joy Guano	7	5	6
Berkley Chemical Co., Norfolk, Va.—			
Berkley Acid Phosphate	14	..	..
Berkley Genuine German Kainit	..	..	12
Berkley Ammoniated Superphosphate	8	2	1
Berkley Bone and Potash Mixture	11	..	2
Berkley Tobacco Guano	8	3	3
Brandon Superphosphate	8	2	2
Select Crop Grower	8.50	2.50	2.50
Advance Crop Grower	8	3	3
Monitor Animal Bone Fertilizer	9	2.25	4
Mascot Truck Guano	7	5	5
Royal Truck Grower	6	7	5
Muriate of Potash	..	..	50
Nitrate of Soda	..	19	..
James Bonday, Jr., & Co., Baltimore, Md.—			
No. 1 Syndikat Sulphate of Potash	..	..	48
No. 1 Syndikat Muriate of Potash	..	..	50
Nitrate of Soda	..	18	..
Old Reliable Brand Genuine German Kainit	..	..	12
Best & Thompson, Goldsboro, N. C.—			
Pure German Kainit	..	..	12

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Blackstone Guano Co., Blackstone, Va.—			
Blackstone Guano Co. Acid Phosphate	14	..	..
Alliance	8	2	2
Alliance for Tobacco	8	2	2
B. G. Co. Bone and Potash	10	..	2
Old Bellefonte Guano	8	4	2
Carolina Special	8	2	..
J. H. Bennett, Clio, S. C.—			
Pure German Kainit	..	..	12
Jno. L. Bailey, Elm City, N. C.—			
Fairmount Guano	8	3	3
Stag Brand Fertilizer	8	2	2
Wm. Bragaw & Co., Washington, N. C.—			
Wm. Bragaw & Co.'s Pamlico Trucker	7	5	8
Wm. Bragaw & Co.'s Old Reliable Premium	8	2	2
Wm. Bragaw & Co.'s Chocowinity Special	5	4	6
Wm. Bragaw & Co.'s Havana Tobacco Guano	8	3	3
Wm. Bragaw & Co.'s Beaufort County Guano	8	3	3
Wm. Bragaw & Co.'s Tuckahoe Tobacco Guano	8	2.50	3
Wm. Bragaw & Co.'s Cottage Grove Special	4	9	6
Wm. Bragaw & Co.'s Tar Heel Special	8	2	2
Cotton-seed Meal	..	7.50	..
J. A. Benton, Ruffin, N. C.—			
N. C. Bright Fertilizer	9	2	2
Buffalo Cotton Mills, Buffalo, N. C.—			
Cotton-seed Meal	..	7.50	..
Columbia Guano Co., Norfolk, Va., Tarboro, N. C., and Columbia, S. C.—			
H. & D.'s H. G. Dissolved Bone	13	..	..
H. & D.'s Ammoniated Guano	8	2	2
H. & D.'s Special Ammoniated Fertilizer	9	3	2.75
Muriate of Potash	..	..	48
Sulphate of Potash	..	..	50
Nitrate of Soda	..	19	..
Genuine German Kainit	..	..	12
Columbia Bone and Potash Mixture	10	..	2
Columbia H. G. 16 Per Cent Acid Phosphate	16	..	..
Columbia H. G. Dissolved Bone	13	..	..
Columbia 14 Per Cent Acid Phosphate	14	..	..
Columbia Acid Phosphate	12	..	..
Columbia Special Truck Guano	8	4	4
Columbia 7 Per Cent Truck Guano	7	7	7
Columbia Potato Guano	7	5	5
Columbia C. S. M. Special	9	2.75	2
Columbia Soluble Guano	8	2	2
Columbia H. G. Special Tobacco Guano	8	2.50	2
Carolina Soluble Guano	8	2	1
Hyco Tobacco Guano	8	3	3
Rex Brand Ammoniated Guano	8	2.50	1
Cotton-seed Meal	..	7.50	..
McRae's Mixture	8	4	7
Crown Brand Peanut Guano	7	..	5

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Cumberland Bone Phosphate Co., Portland, Me., and Charleston, S. C.—			
Cumberland Bone Phosphate of Lime	8	2.25	1
Cowell, Swan & McCotter Co., Bayboro, N. C.—			
Cowell, Swan & McCotter Co. Potato Favorite Guano,	7	4	7
Cowell, Swan & McCotter Co. High Grade Truck Guano	7	5	5
Cowell, Swan & McCotter Co. Quick Grower Guano	8	2.50	3
Cowell, Swan & McCotter Co. Bone and Fish Guano,	8	2	2
Cowell, Swan & McCotter Co. Cabbage Guano	5	10	2.50
Cowell, Swan & McCotter Co. Bone Phosphate	14	..	..
Cowell, Swan & McCotter Co. Crop Guano	8	2	2
Cowell, Swan & McCotter Co. German Kainit	..	..	12
Cowell, Swan & McCotter Co. 14 Per Cent Acid Phos.,	14	..	..
Cowell, Swan & McCotter Co. Bone and Potash	11	..	2
Calder Bros., Wilmington, N. C.—			
Genuine German Kainit	..	..	12
Muriate of Potash	..	..	50
Sulphate of Potash	..	..	50
Nitrate of Soda	..	19	..
Consumers Cotton Oil Co., Tarboro, N. C.—			
Cotton-seed Meal	..	8	..
Cotton-seed Meal	..	7.50	..
Clayton Oil Mill, Clayton, N. C.—			
Cotton-seed Meal	..	7.50	..
Cotton Oil and Fibre Co., Norfolk, Va.—			
Cotton-seed Meal	..	7.50	..
Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.—			
Horne's Best Guano	8	3	3
Pacific Tobacco and Cotton Grower	9	2.75	2
Caraleigh Special Tobacco Guano	8	2.50	3
Planter's Pride Guano	8	2.50	3
Eclipse Ammoniated Guano	8	2.50	2
Eli Ammoniated Guano	8	2	2
Crown Ammoniated Guano	8	2	1.50
Comet Guano	8	2	1
Horne & Son's High Grade Bone and Potash	11	..	5
Electric Bone and Potash Mixture	10	..	2
Morris & Scarboro's Special Bone and Pot. Mixture	10	..	3
Climax Dissolved Bone	14	..	..
16 Per Cent Acid Phosphate	16	..	..
Staple Acid Phosphate	12	..	..
Sterling High Grade Acid Phosphate	13	..	..
Dandy Acid Phosphate	10	..	..
Nitrate of Soda	..	19	..
Muriate of Potash	..	..	50
Sulphate of Potash	..	..	50
Genuine German Kainit	..	..	12

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
W. H. Camp, Petersburg, Va.—			
Camp's Prepared Chemical No. 1	8	3.50	7.50
Camp's Prepared Chemical No. 3	8	2.75	1
Crow Bros., Monroe, N. C.—			
Crow Bros.' High Grade Guano	8	2.50	2.50
Crow Bros.' Special High Grade Cotton Grower	8	3	4
Crow Bros.' High Grade Guano for all Crops	8	4	4
Crow Bros.' Cotton and Corn Guano	8	2	3
Kainit	..	..	12
Muriate of Potash	..	..	50
Fish Scrap	..	10	..
Nitrate of Soda	..	19	..
Crow's High Grade Blood and Fish Guano	8	3	3
Crow's Union County Special Cotton Guano	8	2.50	2
Campobello Oil Mill, Campobello, S. C.—			
Cotton-seed Meal	..	8	..
C. P. Dey, Beaufort, N. C.—			
Ground Fish	..	10	..
Dunn Oil Mill Co., Dunn, N. C.—			
Cotton-seed Meal	..	7.50	..
Etiwan Fertilizer Co., Charleston, S. C.—			
Plow Brand Raw Bone Superphosphate	8	2.50	1
Etiwan Blood and Bone Guano	8	2.50	1
Etiwan Ammoniated Dissolved Bone	8.65	2	2
Etiwan Ammoniated Fertilizer	8	2	2
Etiwan Cotton Compound	8	3	3
Etiwan Dissolved Bone	13	..	..
Etiwan Acid Phosphate with Potash	11	..	1
Etiwan Soluble Bone with Potash	10	..	3
Etiwan Potash Bone	10	..	4
Etiwan Special Potash Mixture	8	..	4
Plow Brand Acid Phosphate with Potash	11	..	1
Plow Brand Special Tobacco Fertilizer	8	4	4
Plow Brand Amm'd Diss. Bone	8.65	2	2
Diamond Soluble Bone	13	..	..
Diamond Soluble Bone with Potash	10	..	2
XX Acid Phosphate with Potash	10	..	2
Genuine German Kainit	..	..	12
Etiwan High Grade Acid Phosphate	14	..	..
Etiwan Superior Cotton Fertilizer	8	4	6
Plow Brand Ammoniated Fertilizer	8	2	2
Etiwan High Grade Cotton Fertilizer	8	3	3
Eureka Fertilizer Co., Perryville, Md.—			
Farmers' Favorite Bone Phosphate	8	2	2
P. P. Superphosphate	14	..	..
Alkaline, Bone and Potash	10	..	2
Irish Potato Guano	6	5	7
Potato Guano	6	5	5
Special Potato	8	2.50	3
Fremont Oil Mill Co., Fremont, N. C.—			
Cotton-seed Meal	..	7.50	..

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Farmers Guano Co., Raleigh, N. C.—			
Golden Grade Guano	8	3	3
Toco Tobacco Guano	8	2.50	3
Big Crop Guano	8	2.50	3
State Standard Guano	8	2	2
Century Bone and Potash Mixture	10	..	2
Farmers' High Grade Acid Phosphate	13	..	..
16 Per Cent Acid Phosphate	16	..	..
Farmers Oil Mill Co., Nashville, N. C.—			
Cotton-seed Meal	..	7.50	..
Farmers Cotton Oil Co., Wilson, N. C.—			
Cotton-seed Meal	..	7.50	..
Fairforest Oil Mill, Fairforest, S. C.—			
Cotton-seed Meal	..	7.50	..
Griffith & Boyd, Baltimore, Md.—			
Spring Crop Grower	6.50	2	4.50
Accomac Trucker	6	5	7
Ammoniated Bone Phosphate	8	2	2
Special 10 Per Cent Truck Phosphate	6	10	2
7 Per Cent Guano	5	7	5
Stable Manure Substitute	5	3	4
Georgia Cotton Oil Co., Atlanta, Ga.—			
Cotton-seed Meal	..	7.50	..
Grant Bros., Memphis, Tenn.—			
Cotton-seed Meal	..	8	..
The Home Fertilizer Chemical Works, Baltimore, Md.—			
Boykin's Vegetable Fertilizer	6	5	6
Boykin's Dissolved Bone Phosphate	14	..	..
Boykin's Alkaline Bone	10	..	2
Boykin's Dissolved Animal Bone	12	2	..
Boykin's Cereal Fertilizer	8	2	2
Phœnix Crop Grower	8	3	2
Home Fertilizer	..	7	7
Home Potato Grower	6	4	4
Cerealite Top Dressing	..	9	2.50
High Grade Acid Phosphate	14	..	..
Yancey's Formula for Yellow Leaf Tobacco	8	3	2
Sulphate of Ammonia	..	25	..
Sulphate of Potash	..	..	48
Muriate of Potash	..	..	50
Nitrate of Soda	..	19	..
Genuine German Kainit	..	..	12
The Hampton Guano Co., Norfolk, Va.—			
PPP Princess Prolific Producer	8	3	3
Reliance Truck Guano	7	5	5
Hampton Genuine German Kainit	..	..	12
Hampton Acid Phosphate	14	..	..
Hampton Ammoniated Superphosphate	8	2	1
Hampton Bone and Potash Mixture	11	..	2

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Hampton Tobacco Guano	8	3	3
Shirley Superphosphate	8	2	2
Arlington Animal Bone Fertilizer	9	2.25	4
Alpha Crop Grower	8.50	2.50	2.50
Virginia Truck Grower	6	7	5
Little's Favorite Crop Grower	7	4	4
Nitrate of Soda	..	19	..
Muriate of Potash	..	..	50
J. C. Hadley & Co., Wilson, N. C.—			
John Hadley's Special High Grade Plant Food	8	2	2
John Hadley's Boss Guano	8	2.75	2.50
S. B. Harrell & Co., Norfolk, Va.—			
Harrell's Champion Cotton and Peanut Grower	8	2	2
Harrell's Acid Phosphate	14	..	..
Harrell's Truck Guano	6	7	5
Hertford Cotton Oil Co., Hertford, N. C.—			
Cotton-seed Meal	..	8	..
The Hubbard Fertilizer Co., Baltimore, Md.—			
Hubbard's 10 Per Cent Guano	4	10	4
Hubbard's Truckers' Royal Seal Compound	6	7	5
Hubbard's Royal Ensign	8	3	4
Hubbard's Standard Bone Superphosphate	8	2	3
Hubbard's Exchange Guano	8	2	2
Hubbard's Soluble Bone and Potash	10	..	2
Hubbard's H. G. Soluble Tennessee Phosphate	14	..	..
Hubbard's Yellow Wrapper Guano	8	3	3
L. Harvey & Son, Kinston, N. C.—			
Genuine German Kainit	..	..	12
Highland Park Mfg. Co., Charlotte, N. C., and Rock-hill, S. C.—			
Cotton-seed Meal	..	8	..
Cotton-seed Meal	..	7.50	..
The Imperial Co., Norfolk, Va.—			
High Grade Excelsior Guano	8	2	2
Imperial 5-6-7 Potato Guano	6	5	7
Imperial High Grade Irish Potato Guano	7	5	8
Imperial Cisco Soluble Guano	8	2	2
Imperial Tobacco Guano	8	3	3
Imperial Fish and Bone	6	4	4
Imperial Martin County Special Crop Grower	9	2.75	2
Imperial Cotton Grower	8	2	1.50
Imperial High Grade Acid Phosphate	14	..	..
Imperial 8-3-3 Ammoniated Guano	8	3	3
Imperial Special 7 Per Cent Guano for Potatoes	5	7	5
Imperial Peanut and Corn Guano	8	2	2
Imperial Special 10 Per Cent Guano	5	10	2.50
Imperial Cubanola Tobacco Guano	4	3	5
Imperial Standard Premium Guano	8	2	1.50
Imperial Bone and Potash	10	..	2
Imperial Champion Guano	8	2	2
Imperial Guano for Bright Tobacco	8	2.50	3

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Imperial Laughinghouse Special Tobacco Guano....	4	4	6
Imperial Special Potato Guano.....	6	5	5
Nitrate of Soda.....	..	19	..
Muriate of Potash.....	..	..	50
Genuine German Kainit.....	..	..	12
Imperial Snowflake Cotton Guano.....	8	2	2
X. L. O. Cotton Guano.....	8	3	3
Imperial Asparagus Mixture.....	2	6.75	6
Imperial High Grade Tennessee Acid Phosphate....	16	..	..
Pure Ground Fish.....	..	10	..
Cotton-seed Meal	..	8	..
The Independent Cotton Oil Co., Wadesboro, N. C., Darlington and Cheraw, S. C.—			
Cotton-seed Meal	..	7.50	..
Kershaw Oil Mill, Kershaw, S. C.—			
Cotton-seed Meal	..	7.50	..
A. S. Lee & Son, Richmond, Va.—			
Lee's Prepared Agricultural Lime.....	..	..	2
Lee's Bone and Potash Fertilizer.....	9	..	4
Lee's Special Wheat Fertilizer.....	9	..	1
Lee's Special Corn Fertilizer.....	9	..	1
Laurinburg Oil Co., Laurinburg, N. C.—			
Cotton-seed Meal	..	7.50	..
A. H. Lindsay, Portsmouth, Va.—			
Cumberland	8	4	4
Lister's A. C. Works, Newark, N. J.—			
7 Per Cent Potato Guano.....	5	7	5
Potato Manure	8	4	7
Harvest Queen	8	2	1
Success Fertilizer	8	2	2
Ammoniated Dissolved Bone Phosphate.....	8	2.50	2
Standard Pure Bone Superphosphate of Lime.....	9	2	2
Lenoir Oil and Ice Co., Kinston, N. C.—			
Cotton-seed Meal	..	8	..
Cotton-seed Meal	..	7.50	..
Louisburg Cotton Oil Mill, Louisburg, N. C.—			
Cotton-seed Meal	..	7.50	..
I. G. Lawrence, Durham, N. C.—			
Bone Meal .....(Total)	22	5	..
E. H. & J. A. Meadows Co., New Bern, N. C.—			
Meadows' 10 Per Cent Ammonia Guano.....	6	10	2.50
Meadows' Dissolved Bone and Potash Compound....	10	..	2
Meadows' Diamond Acid Phosphate.....	14	..	..
Meadows' Roanoke Guano.....	8	2.50	3
Meadows' Great Cabbage Guano.....	7	7	7
Meadows' Great Potato Guano.....	7	5	8
Meadows' Labas Guano.....	8	5	5

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Meadows' Sea Bird Guano	9	4	2.50
Meadows' Cotton Guano	8	2	2
Meadows' All Crop Guano	8	2.50	2.50
Meadows' Gold Leaf Tobacco Guano	8	3	3
Genuine German Kainit	..	..	12
Miller Fertilizer Co., Baltimore, Md.—			
Potato Vegetable Grower	8	2	4
Special Tobacco Grower	8	2	4
High Grade Potato	6	5.50	7
Miller's Irish Potato	8	4	4
Standard Phosphate	8	3	3
Ammoniated Dissolved Bone	8	2	2
Standard Potato	8	3	3
Bateman's High Grade Potato	7	5	5
Farmers' Profit	8	3	3
Harmony	8	2.50	3
S. C. Rock	14	..	..
German Kainit	..	..	12
Cotton Queen	8	2	1
The Mapes Formula and Peruvian Guano Co., New York, N. Y.—			
Veg. Manure or Complete Manure for Light Soils	6	6	6
Soluble Potato Manure	2	7	5
10 Per Cent Truck Special	2	10	4
Complete Manure, "A" Brand	10	3	2.50
Corn Manure	8	3	6
The W. C. Murphy Co., Charleston, S. C.—			
Truck Farmers' Special Guano	10	4	4
Truckers' Special 6-5-6 Vegetable Guano	6	5	6
High Grade Acid Phosphate	13	..	..
Special 8-2-2 Cotton and Corn Guano	8	2	2
Special 8-3-3 Tobacco Guano	8	3	3
Excellent Cotton and Corn Guano	8	2	2
Acid Phosphate and Potash	10	..	2
Wilcox, Gibbs & Co.'s Manipulated Guano	9	2.75	2
Genuine German Kainit	..	..	12
Special 8-2.50-2 Cotton and Corn Guano	8	2.50	2
Truckers' Special Potato Guano	7	4	5
Special 9-3-3 Guano	9	3	3
Special 8-5-7 Guano	8	5	7
Standard 8-2.50-1 Cotton Guano	8	2.50	1
Sulphate of Potash	..	..	48
Muriate of Potash	..	..	48
Sulphate of Ammonia	..	..	25
Nitrate of Soda	..	19	..
Doubly Ammoniated Truck Farmers' Special Guano,	8	8	4
Edmund Mortimer & Co., New York, N. Y.—			
Genuine Peruvian Guano (Total)	20.98	3.80	3.95
Genuine Peruvian Guano, Ex. S. C. Capac. (Total)	23	3.95	4.65
Genuine Peruvian Guano, Ex. Boroda (Total)	21.11	2.87	2.66
W. A. Miller & Son, Lynchburg, Va.—			
Millers' 16 Per Cent Acid Phos	..	16	..
Millers' Hill City Acid Phos	..	14	..
Millers' High Grade Tobacco Fertilizer	8	3	3

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Navassa Guano Co., Wilmington, N. C.—			
Navassa Ammoniated Soluble Guano	8	2.50	2
Navassa Guano for Tobacco	8	2.50	2
Navassa Special Truck Guano	8	4	4
Navassa Complete Fertilizer	8	2	1
Navassa Cotton Fertilizer	8	2	2
Navassa Fruit Growers' Fertilizer	8	2	6
Navassa Strawberry Top Dressing	8	2.50	4
Navassa Root Crop Fertilizer	7	5	7
Navassa Universal Fertilizer	8	2.50	1
Navassa Grain Fertilizer	8	2	2
Navassa Cotton-seed Meal Special (3 per cent)	8	3	2
Navassa Cotton-seed Meal Guano	8	2	2
Navassa Special Wheat Mixture	12	..	4
Navassa Wheat and Grass Grower	10	..	4
Navassa Acid Phosphate	12	..	..
Navassa Dissolved Bone and Potash	10	..	2
Navassa Bone and Potash	8.50	..	2
Navassa High Grade Dissolved Bone	13	..	..
Navassa Acid Phosphate with Potash	10	..	1
Navassa Gray Land Mixture	12	..	4
Navassa Wheat Mixture	10	..	2.25
Croatan Acid Phosphate	10	..	..
Harvest King Guano	8	2	3
Coree Tobacco Guano	8	4	4
Occoneechee Tobacco Guano	8	2	2
Clarendon Tobacco Guano	8	3	3
Warlick's Mixture	8	..	2.25
Harvey's Bone and Potash	8	..	3
Genuine German Kainit	..	..	12
N. C. Cotton Oil Co., Raleigh, N. C.—			
Raleigh Standard Guano	8	2.75	2
New Bern Cotton Oil and Fertilizer Mills, New Bern, N. C.—			
Fourteen Per Cent Acid Phosphate	14	..	..
Genuine German Kainit	..	..	12
Greene County Standard Fertilizer	8	2	2
Craven Bright Tobacco Guano	8	3	3
Craven Special Guano	8	2.50	3
Craven Cotton Guano	8	2	2
Dunn's Standard Truck Grower	7	7	7
Foy's High Grade Fertilizer	8	3	3
Lenoir Bright Leaf Tobacco Grower	8	3	3
Jones County Premium Crop Grower	8	2.50	3
Ives' Irish Potato Guano	7	5	7
Pitt's Prolific Golden Tobacco Guano	8	3	3
Pamlico Electric Top Dresser	5	10	2.50
Carteret Bone and Potash	10	..	2
Onslow County Farmers' Reliance Guano	8	2.50	3
Cotton-seed Meal	..	7.50	..
National Cotton-seed Product Co., Memphis, Tenn.—			
Cotton-seed Meal	..	8	..

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
G. Ober & Sons Co., Baltimore, Md.—			
Ober's Special Compound for Tobacco	8	3	3
Ober's Dissolved Bone Phosphate and Potash	10	..	2
Ober's Dissolved Bone Phosphate	14	..	..
Ober's Special Cotton Compound	8	2	2
Ober's Dissolved Bone Phosphate	14	..	..
Ober's Special High Grade Fertilizer	9	3	3
Ober's Standard Tobacco Fertilizer	8	2	2
Ober's Complete Fertilizer	6	5	6
Ober's Farmers' Standard Ammoniated Phosphate	8	2	2
Ober's Special Ammoniated Dissolved Bone	9	2	2
Kainit	..	..	12
Nitrate of Soda	..	18	..
Muriate of Potash	..	..	50
Oliver Refining Co., Portsmouth, Va.—			
Cotton-seed Meal	..	7.50	..
Pacific Guano Co., Boston, Mass., and Charleston, S. C.—			
Pacific Special High Grade Fertilizer	8	3	3
Soluble Pacific Guano	8.50	2	2
Pacific Acid Phosphate	12	..	..
Pocahontas Guano Co., Lynchburg, Va.—			
Spot Cash Tobacco Compound	8	2.50	3
High Grade 4 Per Cent Tobacco Compound (Mohawk King Brand)	9	2.25	4
Standard Tobacco Guano (Old Chief Brand)	9	2	2
Yellow Tobacco Special	9	2	2
Carrington's Banner Brand Guano	8	2	2
Carrington's Superior Grain Compound	10	..	2
Pocahontas Special Tobacco Fertilizer	9	3	3
Grain Special Bone and Potash (New Rival Brand),	10	..	1.65
Pure Raw Bone Meal (Total)	22	4.50	..
Apex Brand Farmers' Favorite Guano	8	3	3
Imperial Dissolved S. C. Phosphate	14	..	..
Piedmont-Mt. Airy Guano Co., Baltimore, Md.—			
Piedmont High Grade S. C. Bone	14	..	..
Genuine German Kainit	..	..	12
Piedmont Guano for Tobacco	8	2.50	3
Piedmont High Grade Ammoniated Bone and Potash,	8	3	3
Piedmont Special Farmers' Tobacco Guano	8.40	3	4
Piedmont Special for Cotton, Corn and Peanuts	8	2	2
Levering's Reliable Tobacco Guano	8	3	3
Piedmont Plow Brand	8	2	2
Piedmont Potato Producer	5	3	6
Piedmont Bone and Peruvian	8	2	2
Piedmont Farmers' High Grade Bone and Potash	10	..	2
Piedmont High Grade Vegetable Manure	6	5	7
Piedmont Essential Tobacco Compound	9	2	2
Muriate of Potash	..	..	50
Nitrate of Soda	..	19	..
Piedmont Soluble Bone and Potash	8	..	2
Piedmont Potashed Bone	10	..	4

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
The Pocomoke Guano Co., Norfolk, Va.—			
Peerless Acid Phosphate	14	..	..
Alkali Bone	11	..	2
Electric Crop Grower	8.50	2	2
Pamlico Superphosphate	8	2	2
Pocomoke Superphosphate	8.50	2	2
Genuine German Kainit	..	..	12
Cinco Tobacco Guano	8.50	2.50	2.50
Harvey High Grade Monarch	8	3	3
Monarch Tobacco Grower	8	3	3
Standard Truck Guano	7	5	5
Monticello Animal Bone Fertilizer	9	2.25	4
Seaboard Popular Trucker	6	7	5
Coast Line	5	10	3
Freeman's 7 Per Cent Irish Potato Grower	6	7	5
L. P. H. Premium	8	2	2
Hornthal Tobacco Guano	8	2	3
Crescent Complete Compound	8	2	3
Nitrate of Soda	..	19	..
Muriate of Potash	..	..	50
Pure Ground Bone (Total)	20	4.50	..
Pine Level Oil Mill, Pine Level, N. C.—			
Cotton-seed Meal	..	7.50	..
Patapsco Guano Co., Baltimore, Md.—			
Patapsco Dissolved S. C. Phosphate	14	..	..
Patapsco Soluble Bone and Potash	10	..	2
Patapsco High Grade Bone and Potash	11	..	3
Patapsco Guano	9.25	2.50	2
Patapsco Guano for Tobacco	9.25	2.50	2
Patapsco Trucker for Early Vegetables	7	5	5
Choctaw Guano	8	3	3
Unicorn Guano	8	2.50	3
Baltimore Soluble Phosphate	11	..	2
Planters' Favorite	8	2	2
Florida Soluble Phosphate	16	..	..
Genuine German Kainit	..	..	12
Sea Gull Ammoniated Guano	8	2	2
Patapsco Tobacco Fertilizer	9	3	3
Patapsco Special Tobacco Mixture	8	2.50	3
Patapsco 7-7-7 Truck Guano	7	7	7
Money Maker Guano	7	4.50	6
Patapsco Potato Guano	6	5	7
Powhatan Chemical Co., Richmond, Va.—			
Powhatan Trucker	7	6	5
North State Special	8	4	4
P. C. Co.'s Hustler	8	3	3
Economic Cotton Grower	9	2.75	2
White Leaf Tobacco Fertilizer	8	2.50	3
King Brand Fertilizer	8	2.50	3
Magic Tobacco Grower	8	2	2
Magic Special Fertilizer	8	2	2
Magic Cotton Grower	8	2	2
Magic Brand Ammoniated Phosphate	8	2	1
Magic Bone and Potash Mixture	10	..	4

Name and Address of Manufacturer and Name of Brand,	Avail. Phos. Acid.	Ammonia.	Potash.
Bone and Potash Mixture	10	..	2
Powhatan Bone and Potato Mixture	8	..	4
Dixie Grain and Grass Grower	8	..	2
Magic Dissolved Bone Phosphate	16	..	..
High Grade Acid Phosphate	14	..	..
Powhatan Acid Phosphate	13	..	..
Virginia Dissolved Bone	12	..	..
Magic S. C. Phosphate	10	..	..
Pure Raw Bone Meal (Total)	20	4	..
Bone Meal (Total)	25	3	..
Pure German Kainit	..	..	12
Guilford Special Tobacco Fertilizer	9	3	6
Parker & Hunt, Oxford, N. C.—			
Parker & Hunt's Special Fertilizer	9	2.50	1.50
The Quinnipiac Co., Charleston, S. C.—			
Quinnipiac Pine Island Ammoniated Superphosphate,	9	2.25	1
Quinnipiac Acid Phosphate	13	..	..
F. S. Royster Guano Co., Norfolk, Va., Tarboro, N. C., and Columbia, S. C.—			
Truckers' Delight	8	4	4
Bonanza Tobacco Guano	8	3	3
Orinoco Tobacco Guano	8	2.50	3
Special Tobacco Compound	8	2.50	2
Farmers' Bone Fertilizer	8	2	2
Arrow Brand Guano	8	2.50	1
Special Compound	8	2	1
Caledonia Compound	8	2	1
Royster's Meal Mixture	9	2.75	2
Royal Potato Guano	7	5	5
Ballentine's Potato Guano	6	7	7
Royster's Special Sweet Potato Guano	8	3	3
Royster's Early Truck Guano	7	5	8
Royster's Special 7 Per Cent Truck Guano	7	7	7
Cooper's Pungo Guano	8	2.50	2
Royster's XX Acid Phosphate	12	..	..
Royster's High Grade Dissolved Bone	13	..	..
Royster's 14 Per Cent Acid Phosphate	14	..	..
Royster's 16 Per Cent Acid Phosphate	16	..	..
Royster's Bone and Potash Mixture	10	..	2
Harvey's Potash Mixture	8	..	3
Carolina Bone and Potash Mixture	8	..	2
Genuine German Kainit	..	..	12
Sulphate of Potash	..	..	50
Muriate of Potash	..	..	48
Nitrate of Soda	..	19	..
Cotton-seed Meal	..	7.50	..
Royal Special Potato Guano	7	5	7
Marlboro High Grade Cotton Grower	8	3	3
Magic Top Dresser	9	2.50	2
Royster's Peanut Special	7	..	5
Tomlinson's Special	9	3	5
F. S. Royster, Tarboro, N. C.—			
Genuine German Kainit	..	..	12

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Read Phosphate Co., Charleston, S. C.—			
Read's High Grade Acid Phosphate	13	..	..
Read's High Grade Dissolved Bone	14	..	..
Read's Special Potato Mixture	10	..	4
Read's High Grade Ammoniated Guano	9	2	3
Read's Tobacco Leaf	8	3	3
Read's Alkaline Bone	10	..	2
Read's Soluble Fish Guano	8	2	2
Read's Cotton Flower	8	2.50	1
Read's Blood and Bone Fertilizer No. 1	8	2	2
Genuine German Kainit	..	..	12
Rasin Monumental Co., Baltimore, Md.—			
Rasin's Dixie Guano	8	2	1
Rasin's Bone and Potash Fertilizer	10	..	2
Rasin's 16 Per Cent Acid Phos	16	..	..
Rasin's 13 Per Cent Acid Phos	13	..	..
Rasin's Acid Phos	14	..	..
Rasin's Empire Guano	8	2	2
Richmond Guano Co., Richmond, Va.—			
Special High Grade for Truck	7	6	5
Southern Trucker	8	5	5
Perfection Special	8	4	4
Carter's Special Tobacco Fertilizer	4	3	6
Gilt Edge Fertilizer	8	3	3
Burton's Special Tobacco Fertilizer	9	2.50	3
Carolina Cotton Grower	9	2.75	2
Carolina Bright Special Tobacco Fertilizer	8.50	2.75	7.25
Tip Top Fertilizer	8	2.50	3
Special Premium Brand for Tobacco	8	2.25	2.25
Special Premium Brand for Plants	8	2.25	2.25
Bone Mixture	8	2	1
Premium Bone and Potash Mixture	13	..	3
Rex Bone and Potash Mixture	10	..	4
Tip Top Bone and Potash Mixture	8	..	4
Bone and Potash Mixture	10	..	2
Alkaline Bone	10	..	2
Premium Grain and Grass Grower	8	..	2
Rex Dissolved Bone Phosphate	16	..	..
High Grade Acid Phosphate	14	..	..
High Grade Wheat and Grass Fertilizer	14	..	..
Premium Dissolved Bone	13	..	..
Dissolved S. C. Phosphate	12	..	..
Old Homestead Dissolved Bone	10	..	..
Pure Raw Bone Meal (Total)	20	4	..
Bone Meal	25	3	..
Pure German Kainit	..	..	12
Premium Brand Fertilizer	8	2	2
Premium Tobacco Fertilizer	8	2	2
Ten Per Cent Cabbage Guano	6	10	2
Carolina Bright for Cotton	8	2.50	1.50
Hunter & Dunn's Special Ammoniated Fertilizer	9	3	2.25
Hunter & Dunn's Ammoniated Fertilizer	8	2	2
Hunter & Dunn's Dissolved Bone	13	..	..
Saunders' Special Formula for Bright Tobacco	9	3.50	5
Clark's Special Formula	7	6	6

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Red Springs Oil and Fertilizer Co., Red Springs, N. C.—			
Cotton-seed Meal	..	8	..
Reidsville Fertilizer Co., Reidsville, N. C.—			
Lion Brand Fertilizer	9	3	6
Royal Fertilizer	8	3	3
Broad Leaf Tobacco Guano	8	2.25	2.50
Champion	8	2	2
Banner Fertilizer	8	2	1
Bone and Potash	10	..	4
Bone and Potash	8	..	2
Rowland Oil and Fertilizer Co., Rowland, N. C.—			
Cotton-seed Meal	..	8	..
Rich Hill Oil Mill Co., Rich, S. C.—			
Cotton-seed Meal	..	8	..
Swift Fertilizer Works, Atlanta, Ga.—			
Swift's Special H. G. Guano	9.50	5	3
Swift's Monarch H. G. Guano	8	4	4
Swift's Cotton King High Grade Guano	9	3	2
Swift's High Grade Tobacco Guano	8	2	4
Swift's Eagle H. G. Guano	10	2	2
Swift's Farmers' Favorite High Grade Guano	9	2	3
Swift's Red Steer Standard Grade Guano	8	2	2
Swift's Golden Harvest Standard Grade Guano	8	2	2
Swift's Dayvault Special H. G. Phos. and Potash	12	..	6
Swift's Cotton Plant Standard Grade Guano	9	2	1
Swift's Farmers' Home H. G. Phosphate and Potash,	10	..	4
Swift's Atlanta H. G. Phosphate and Potash	12	..	4
Swift's Plantation Stand. Grade Phos. and Potash	8	..	4
Swift's Wheat Grower Standard Grade Phosphate and Potash	10	..	2
Swift's Special H. G. Acid Phosphate	16	..	..
Swift's Field and Home Standard Grade Phosphate and Potash	10	..	2
Swift's Harrow High Grade Acid Phosphate	13	..	..
Swift's Cultivator High Grade Acid Phosphate	14	..	..
Swift's Muriate of Potash	..	..	50
Swift's Chattahoochee Standard Grade Acid Phos	12	..	..
Swift's Nitrate of Soda	..	16	..
Swift's German Kainit	..	..	12
Swift's High Grade Phos. and Potash	12	..	6
Swift & Company, Chicago, Ill.—			
Swift's Ground Dried Blood	..	16	..
Swift's No. 1 Ground Tankage	6	10	..
Swift's Raw Bone Meal (Total)	23	4	..
Swift's Bone Meal (Total)	25	3	..
Southern Cotton Oil Co., Gibson, Fayetteville, Wilson, Monroe, Conetoe, Tarboro, Goldsboro, N. C., and Dillon, S. C.—			
Cotton-seed Meal	..	7.50	..
Southern Cotton Oil Co., Charlotte and Concord, N. C.—			
Cotton-seed Meal	..	8	..

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Spartanburg Fertilizer Co., Spartanburg, S. C.—			
Brown's Compound	10	..	2
Tiger Brand	8	2	6
Tiger Brand Acidulated Phosphate	14	..	..
Potato Guano	7	3	7
Buenos	8	4	4
Glencoe	8	2	1
Satulah	8	2	2
West's Potash Acid	12	..	3
Spartanburg Dissolved Bone	13	..	..
Archer's Acid Phosphate	12	..	..
Kainit	..	..	12
Muriate of Potash	..	..	50
Nitrate of Soda	..	18	..
Sulphate of Potash	..	..	48
Smith-Davis, Wilmington, N. C.—			
Nitrate of Potash	..	16	44
Nitrate of Soda	..	19	..
Sulphate of Potash	..	..	49
Muriate of Potash	..	..	50
R. N. Sweet, Wilmington, N. C.—			
Underwriters Guano	7	3	3
B. D. Springs & Co., Charlotte, N. C.—			
Muriate of Potash	..	..	50
Statesville Oil and Fertilizer Co., Statesville, N. C.—			
Cotton-seed Meal	..	7.50	..
Southern Exchange Co., Maxton, N. C.—			
McKimmon's Special Truck Formula	8	5	7
Spring Hope Cotton Oil Co., Spring Hope, N. C.—			
Cotton-seed Meal	..	7.50	..
Sumter Banking and Mercantile Co., Sumter, S. C.—			
Genuine German Kainit	..	...	12
Sledge & Wells Co., Memphis, Tenn.—			
Cotton-seed Meal	..	8	..
S. C. Cotton Oil Co., Greenville, S. C.—			
Cotton-seed Meal	..	7.50	..
S. C. Cotton Oil Co., Columbia, S. C.—			
Cotton-seed Meal	..	7.50	..
Tuscarora Fertilizer Co., Wilmington, N. C., and Baltimore, Md.—			
Acid Phosphate	13	..	..
Acid Phosphate	14	..	..
Acid Phosphate	16	..	..
Acid Phosphate	17	..	..
Tuscarora Alkaline	10	..	5

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Tuscarora Standard	8	2	2
Big Four	7	2	4
Cotton Special	8	3	3
Tobacco Special	8	3	3
Tuscarora Champion	8	2.50	2.50
Tuscarora Trucker	8	5	7
Dried Blood	..	16	..
Animal Bone (Total)	24	3	..
Nitrate of Soda	..	18	..
Sulphate of Potash	..	..	50
Muriate of Potash	..	..	48
Bone and Potash	10	..	2
Kainit	..	..	12
Manure Substitute	6	4	4
Special Trucker	8	4	4
King Cotton	8	2.50	1
King Cotton No. 2	8	2.50	2
High Grade Potato	8	2	10
Berry King	8	2.50	4
Tomlinson, Bynum & Co., Wilson, N. C.—			
Dixie Cotton Grower	8	2	1
Tar River Oil Co.—			
Cotton-seed Meal	..	8	..
Tiger Shoals Milling Co., Wellford, S. C.—			
Cotton-Seed Meal	..	7.50	..
R. L. Upshur, Norfolk, Va.—			
Upshur's 5 Per Cent Guano	5	5	5
Upshur's Farmers' Challenge F. C. Guano	8	7	6
Upshur's Farmers' Favorite FF Guano	8	5	6
Upshur's G. G. & C. Grain, Grass and Cotton Guano,	8	2	2
Upshur's High Grade Acid Phosphate	14	..	..
Upshur's Peanut Guano	8	2	2
Upshur's Tobacco Guano	8	3	3
Upshur's 7 Per Cent Irish Potato Guano	6	7	5
Genuine German Kainit	..	..	12
Upshur's Norfolk Special 10 Per Cent Guano	5	10	2
Upshur's High Grade Cotton Guano	8	3	3
Upshur's Fish, Bone and Potash Guano	8	2	4
Premo Cotton Guano	8	2	1.50
Virginia-Carolina Chemical Co., Richmond, Va.—			
Admiral	8	3	2.50
Diamond Dust (C. S. M.)	8	2	2
Delta (C. S. M.)	8	2.75	2.50
Blue Star (C. S. M.)	8	2.50	3
Good Luck (C. S. M.)	8	3	2.50
North State Guano (C. S. M.)	8	2	1
Plant Food	8	2	2
Prolific Cotton Grower (C. S. M.)	9	2.75	2
Special High Grade Tobacco Fertilizer (C. S. M.)	8	3	3
Split Silk (C. S. M.)	8	3	2.50
Superlative Guano (C. S. M.)	8	2.50	3
White Stem (C. S. M.)	9	2.75	2
Wilson Standard (C. S. M.)	8	2	2

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Winston Special for Cotton (C. S. M.)	8	2	2
Cotton-seed Meal	..	7.50	..
Nitrate of Soda	..	19	..
Muriate of Potash	..	..	50
Sulphate of Potash	..	..	50
Genuine German Kainit	..	..	12
V.-C. C. Co.'s 16 Per Cent Acid Phosphate	16	..	..
V.-C. C. Co.'s 14 Per Cent Acid Phosphate	14	..	..
V.-C. C. Co.'s Lion High Grade Tobacco Fertilizer	8	3	4
V.-C. C. Co.'s Special Tobacco Mixture	10	..	4
Battle's Crop Grower	12	..	3
Royal Crown	8	2.75	2
Orange Grove	8	2.75	2.50
Farmer's Friend Favorite Fertilizer Special	8.50	2	2
Va.-Car. Chemical Co.'s High Grade Tobacco Fertilizer	8	3	10
Ajax (C. S. M.)	8	2	2
Atlas Guano (C. S. M)	8	3	2.50
Farmer's Favorite Fertilizer (C. S. M.)	8	2	2
V.-C. C. Co.'s Standard Bone and Potash	10	..	2
Allison & Addison's Star Brand Vegetable Guano	8	4.50	4
Allison & Addison's Star Brand Guano	8	2	1
Allison & Addison's Standard Acid Phosphate	12	..	..
Allison & Addison's McGavock's Special Potash Mixture	8	..	2.25
Allison & Addison's Star Brand Spl. Tobacco Manure	9	2.75	2
Allison & Addison's Fulton Acid Phosphate	14	..	..
Allison & Addison's B. P. Potash Mixture	10	..	2
Allison & Addison's Anchor Brand Tobacco Fertilizer,	8.50	2.75	2
Allison & Addison's Anchor Brand Fertilizer	8	2	2
Allison & Addison's I X L Acid Phosphate	13	..	..
Allison & Addison's A. A	8	3	3
Allison & Addison's Rocketts Acid Phosphate	10	..	..
Allison & Addison's Old Hickory Guano	8	2	2
Atlantic & Va. Fert. Co.'s Orient Complete Manure	8	2	1
Atlantic & Va. Fert. Co.'s Crenshaw's Acid Phos	13	..	..
Atlantic & Va. Fert. Co.'s Eureka Ammoniated Bone Special for Tobacco	9	2.50	2
Atlantic & Va. Fert. Co.'s Valley of Virginia Phos	14	..	..
Atlantic & Va. Fert. Co.'s Virginia Trucker	8	5	5
Atlantic & Va. Fert. Co.'s Eureka Ammo'd Bone	8	2	2
Atlantic & Va. Fert. Co.'s Eureka Bone and Potash Compound	10	..	2
Atlantic & Va. Fert. Co.'s Orient Special for Tobacco,	8	2	2
Atlantic & Va. Fert. Co.'s Carolina Trucker	7	7	7
Atlantic & Va. Fert. Co.'s Eureka Acid Phosphate	10	..	..
Atlantic & Va. Fert. Co.'s Our Acid Phosphate	12	..	..
Charlotte Oil & Fert. Co.'s The Leader (B. G.)	8	2	2
Charlotte Oil & Fert. Co.'s Ten-Two Bone and Potash	10	..	2
Charlotte Oil & Fert. Co.'s King Cotton Grower	8	2	2
Charlotte Oil & Fert. Co.'s Groom's Spl. Tobacco Fertilizer	8	3	4
Charlotte Oil & Fert. Co.'s Charlotte Ammoniated Fertilizer (C. S. M.)	8	2.50	1.50
Charlotte Oil & Fert. Co.'s Charlotte Acid Phosphate,	13	..	..
Charlotte Oil & Fert. Co.'s Charlotte Ammoniated Guano (B. G.)	8	2.50	1.50

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Charlotte Oil & Fert. Co.'s High Grade Special Tobacco Fertilizer	9	2.50	2
Charlotte Oil & Fert. Co.'s Charlotte 15 Per Cent Acid Phosphate	15	..	..
Charlotte Oil & Fert. Co.'s Special 3 Per Cent Guano (C. S. M.)	8	3	2
Charlotte Oil & Fert. Co.'s Queen of the Harvest (C. S. M.)	8	2	1
Charlotte Oil & Fert. Co.'s Charlotte Dissolved Bone,	12	..	..
Charlotte Oil & Fert. Co.'s Catawba Acid	10	..	..
Charlotte Oil & Fert. Co.'s Catawba Guano (B. G)	8	2	1
Charlotte Oil & Fert. Co.'s McCrary's Diamond Bone and Potash	8	..	3
Charlotte Oil & Fert. Co.'s Oliver's Perfect Wheat Grower	11	3	4
Davie & Whittle's Vinco Guano	8	2	1
Davie & Whittle's Owl Brand High Grade Dis. Bone,	14	..	..
Davie & Whittle's Owl Brand High Grade Phosphate,	13	..	..
Davie & Whittle's Owl Brand Guano for Tobacco	8	3	3
Davie & Whittle's Owl Brand Special Tobacco	9	2.50	2
Davie & Whittle's Owl Brand Guano	8	2	2
Davie & Whittle's Owl Brand Truck Guano	8	6	5
Davie & Whittle's Owl Brand Acid Phos. with Potash	10	..	2
Davie & Whittle's Owl Brand Acid Phosphate	10	..	..
Davie & Whittle's Owl Brand Dissolved Bone	12	..	..
Davie & Whittle's Owl Brand Guano No. 2	8	2	1
Durham Fert. Co.'s Bone and Potash Mixture	10	..	2
Durham Fert. Co.'s Gold Medal Brand	8	3	3
Durham Fert. Co.'s Genuine Bone and Peruvian Guano	8	2	2
Durham Fert. Co.'s Double Bone Phosphate	13	..	..
Durham Fert. Co.'s North Carolina Farmers' Alliance Official Guano	8	2.50	3
Durham Fert. Co.'s Great Wheat and Corn Grower	10	..	1.50
Durham Fert. Co.'s Durham Ammoniated Fertilizer	8	2	1
Durham Fert. Co.'s Golden Leaf Bright Tobacco Guano	8	3	3
Durham Fert. Co.'s Special Plant and Truck Fert	8	5	3
Durham Fert. Co.'s Raw Bone Superphosphate	8	2.50	1.50
Durham Fert. Co.'s Progressive Farmer Guano	8	2	1
Durham Fert. Co.'s L. & M. Special	9	3	2
Durham Fert. Co.'s Excelsior Dis. Bone Phos	14	..	..
Durham Fert. Co.'s Durham High Grade Acid Phos.,	13	..	..
Durham Fert. Co.'s North Carolina Farmers' Alliance Official Acid Phosphate	13	..	..
Durham Fert. Co.'s Standard High Grade Acid Phos.,	13	..	..
Durham Fert. Co.'s Blacksburg Dissolved Bone	13	..	..
Durham Fert. Co.'s Durham Acid Phosphate	10	..	..
Durham Fert. Co.'s Best Potato Manure	7	7	7
Durham Fert. Co.'s Blacksburg Soluble Guano	8	2	2
Durham Fert. Co.'s Standard Guano	9	2	2
Durham Fert. Co.'s Raw Bone Superphosphate for Tobacco	8	2.50	2
Durham Fert. Co.'s Carr's Special Wheat Grower	8	..	4
Durham Fert. Co.'s Standard Wheat Grower	10	..	2
Durham Fert. Co.'s Blue Ridge Wheat Grower	10	..	2
Durham Fert. Co.'s Diamond Wheat Manure	10	..	3
Genuine Bone and Peruvian Guano	8	2	2

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Lynchburg Guano Co.'s Lynchburg Dissolved Bone and Potash	10	..	2
Lynchburg Guano Co.'s Alpine Mixture	10	..	5
Lynchburg Guano Co.'s Golden Age Pure Bone Meal (Total)	20	4	..
Lynchburg Guano Co.'s S. W. Special Bone and Potash Mixture	10	..	4
Lynchburg Guano Co.'s Buffalo Guano	8	2.50	3
Lynchburg Guano Co.'s Bright Belt Guano	8	2	..
Lynchburg Guano Co.'s Solid Gold Tobacco	8	2.75	4
Lynchburg Guano Co.'s Independent Standard	8.50	2	2
Lynchburg Guano Co.'s New Era	8	2	1
Lynchburg Guano Co.'s Lynchburg Soluble	8	2	2
Lynchburg Guano Co.'s Lynchburg Soluble for Tobacco	8	2	2
Lynchburg Guano Co.'s Lynchburg High Grade Acid Phosphate	14	..	..
Lynchburg Guano Co.'s Arvonia Acid Phosphate	13	..	..
Lynchburg Guano Co.'s Otter Brand Acid Phos	10	..	..
Lynchburg Guano Co.'s Spartan Acid Phos	12	..	..
Lynchburg Guano Co.'s Ironside Acid Phos	16	..	..
Norfolk & Car. Chem. Co.'s Norfolk Best Acid Phos.,	13	..	..
Norfolk & Car. Chem. Co.'s Amazon High Grade Manure	8	3	3
Norfolk & Car. Chem. Co.'s Bright Leaf Tobacco Grower	8	3	3
Norfolk & Car. Chem. Co.'s Genuine Slaughter House Bone	8	2	2
Norfolk & Car. Chem. Co.'s Genuine Slaughter House Bone, made especially for Tobacco	8	2.50	2
Norfolk & Car. Chem. Co.'s Norfolk Bone and Potash,	10	..	2
Norfolk & Car. Chem. Co.'s Norfolk Truck and Tomato Grower	8	5	5
Norfolk & Car. Chem. Co.'s Pretlow's Champion for Peanuts, Cotton and Corn	8	2	1
Norfolk & Car. Chem. Co.'s Cooper's Special Bright Tobacco Fertilizer	8	2.50	3
Norfolk & Car. Chem. Co.'s Crescent Brand Ammoniated Fertilizer	8	2	1
Norfolk & Car. Chem. Co.'s Norfolk Reliable Acid Phosphate	10	..	..
Old Dominion Guano Co.'s Potato Manure	7	5	8
Old Dominion Guano Co.'s High Grade Bone Phos..	13	..	..
Old Dominion Guano Co.'s Farmer's Special Tobacco Fertilizer	8	3	3
Old Dominion Guano Co.'s Royster's High Grade Acid Phosphate	12	..	..
Old Dominion Guano Co.'s Standard Raw Bone Soluble Guano	8	2	1
Old Dominion Guano Co.'s Farmer's Friend Fertilizer	8	2	2
Old Dominion Guano Co.'s Farmer's Friend High Grade Fertilizer	8	3	3
Old Dominion Guano Co.'s Dissolved Bone and Potash	8.50	..	2
Old Dominion Guano Co.'s Soluble Guano	8	2	2
Old Dominion Guano Co.'s Soluble Tobacco Guano..	8	2	2
Old Dominion Guano Co.'s High Grade Alkaline Bone,	10	..	2
Old Dominion Guano Co.'s Osceola Tobacco Guano..	8	2.50	3

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Old Dominion Guano Co.'s Old Dominion Sweet Potato Guano	6	2	6
Old Dominion Guano Co.'s Old Dominion Special Wheat Guano	8	2	2
Old Dominion Guano Co.'s Miller's Special Wheat Mixture	8	..	4
Old Dominion Guano Co.'s Planter's Bone and Potash Mixture	10	..	3
Old Dominion Guano Co.'s Bullock's Cotton Grower,	8	2	2
Old Dominion Guano Co.'s Isley's Formula of Dissolved Bone Potash and Chemicals	8	3	3
Old Dominion Guano Co.'s Old Dominion 7-7-7 Truck Guano	7	7	7
Old Dominion Guano Co.'s Old Dominion 6-7-5 Truck Guano	6	7	5
Old Dominion Guano Co.'s Norfolk Soluble Bone	10	..	..
Powers, Gibbs & Co.'s Gibbs' High Grade Ammoniated Guano	8	2.50	1
Powers, Gibbs & Co.'s Old Kentucky High Grade Tobacco Manure	8	3	3
Powers, Gibbs & Co.'s Truck Farmer's Special Ammoniated Guano	8	4	5
Powers, Gibbs & Co.'s Carolina Golden Ammoniated Guano for Tobacco	8	2.50	3
Powers, Gibbs & Co.'s Cotton Brand High Grade Acid Phosphate	13	..	..
Powers, Gibbs & Co.'s Cotton-seed Meal Standard Guano	9	3	2
Powers, Gibbs & Co.'s Cotton-seed Meal Soluble Ammoniated Guano	8	2	2
Powers, Gibbs & Co.'s Dissolved Bone and Potash	10	..	2
Powers, Gibbs & Co.'s Eagle Island Ammo'd Guano	8	2	2
Powers, Gibbs & Co.'s Cotton Belt Ammo'd Guano	8	3	2
Powers, Gibbs & Co.'s Powers' High Grade Ammoniated Guano	8	2.50	3
Powers, Gibbs & Co.'s Almont Soluble Ammoniated Guano	8	2	2
Powers, Gibbs & Co.'s Cotton Brand Ammoniated Dissolved Bone	8	2	1
Powers, Gibbs & Co.'s Acid Phos. and Potash	10	..	1
Powers, Gibbs & Co.'s Almont Wheat Mixture	10	..	3
Powers, Gibbs & Co.'s Almont High Grade Acid Phosphate	13	..	..
Powers, Gibbs & Co.'s Cotton Brand Acid Phos	12	..	..
Powers, Gibbs & Co.'s Almont Acid Phos	10	..	..
Powers, Gibbs & Co.'s Fulp's High Grade Acid Phos.,	13	..	..
Southern Chem. Co.'s Mammoth Wheat and Grass Grower	10	..	2
Southern Chem. Co.'s Winston Bone and Potash Compound	10	..	2
Southern Chem. Co.'s Winner Grain Mixture	10	..	4
Southern Chem. Co.'s Red Cross 14 Per Cent Acid Phosphate	14	..	..
Southern Chem. Co.'s Comet 16 Per Cent Acid Phos.,	16	..	..
Southern Chem. Co.'s Mammoth Corn Grower	10	..	2
Southern Chem. Co.'s Electric Tobacco Guano	8	2	2
Southern Chem. Co.'s Electric Standard Guano	8	2	2
Southern Chem. Co.'s Pilot Ammoniated Guano Special for Tobacco	8	2.50	3

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Southern Chem. Co.'s Victor High Grade Acid Phos.,	13	..	..
Southern Chem. Co.'s Yadkin Complete Fertilizer...	8	2	1
Southern Chem. Co.'s Quick Step Bone and Potash..	10	..	1
Southern Chem. Co.'s Click's 16 Per Cent Acid Phos.,	16	..	..
Southern Chem. Co.'s Chatham Acid Phos.....	13	..	..
Southern Chem. Co.'s Elkin Acid Phosphate.....	12	..	..
Southern Chem. Co.'s Horse Shoe Acid Phosphate...	10	..	..
Southern Chem. Co.'s Tar Heel Acid Phosphate....	12	..	..
Southern Chem. Co.'s George Washington Plant Bed Fertilizer for Tobacco.....	8	3	2.50
Southern Chem. Co.'s Sun Brand Guano.....	9	2.50	5
Southern Chem. Co.'s Farmer's Pride Bone and Potash	10	..	3
Southern Chem. Co.'s Reaper Grain Application....	12	..	3
J. G. Tinsley & Co.'s Richmond Brand Guano.....	8	2	1
J. G. Tinsley & Co.'s Irish Potato Guano.....	6	6	6
J. G. Tinsley & Co.'s Tobacco Fertilizer.....	8	4	2.50
J. G. Tinsley & Co.'s Stonewall Tobacco Guano.....	8	2	2
J. G. Tinsley & Co.'s 10 Per Cent Truck Guano.....	5	10	2.50
J. G. Tinsley & Co.'s Dissolved S. C. Bone.....	13	..	..
J. G. Tinsley & Co.'s Lee Brand Guano.....	8	2	2
J. G. Tinsley & Co.'s Bone and Potash Mixture.....	10	..	2
J. G. Tinsley & Co.'s Powhatan High Grade Phos...	14	..	..
J. G. Tinsley & Co.'s Killikinnick Tobacco Mixture..	8	2.50	3
J. G. Tinsley & Co.'s Stonewall Guano.....	8	2	2
J. G. Tinsley & Co.'s Stonewall Brand Acid Phos...	10	..	..
J. G. Tinsley & Co.'s Tinsley's Strawberry Grower..	6	4	4
S. W. Travers & Co.'s Dissolved Bone Phosphate....	14	..	..
S. W. Travers & Co.'s Standard Dissolved S. C. Bone,	13	..	..
S. W. Travers & Co.'s National Fertilizer.....	8	2	2
S. W. Travers & Co.'s National Spl. Tobacco Fert...	8	2	2
S. W. Travers & Co.'s Capital Tobacco Fertilizer...	8	4	3
S. W. Travers & Co.'s Capital Dissolved S. C. Bone..	12	..	..
S. W. Travers & Co.'s Cotton Fertilizer.....	8	2.50	1
S. W. Travers & Co.'s Capital Bone and Potash Compound	10	..	2
S. W. Travers & Co.'s Beef, Blood and Bone Fertilizer,	8	2	1
S. W. Travers & Co.'s Special Wheat Compound....	8	..	4
S. W. Travers & Co.'s Champion Acid Phosphate....	10	..	..
Va. State Fert. Co.'s Va. State High Grade Tobacco Guano	8	2	2
Va. State Fert. Co.'s Austin Tobacco Grower.....	8	2.50	2
Va. State Fert. Co.'s Gilt Edge Brand Acid Phos....	14	..	..
Va. State Fert. Co.'s XX Potash Mixture.....	10	..	4
Va. State Fert. Co.'s Bull Run Acid Phos.....	16	..	..
Va. State Fert. Co.'s Dunnington's Special Formula for Tobacco	8	3	3
Va. State Fert. Co.'s Clipper Brand Acid Phos.....	13	..	..
Va. State Fert. Co.'s Alps Brand Acid Phos.....	12	..	..
Va. State Fert. Co.'s Lurich Acid Phos.....	10	..	..
Va. State Fert. Co.'s Gilt Edge Brand Pure Bone Meal .....(Total)	20	4	..
Va. State Fert. Co.'s Mountain Top Bone and Potash,	10	..	5
Va. State Fert. Co.'s High Grade Dis. Bone and Potash	10	..	2
Va. State Fert. Co.'s Gilt Edge Dis. Bone and Potash,	8.50	..	2
Va. State Fert. Co.'s Number One Soluble Guano....	9	2	..
Va. State Fert. Co.'s Highland King.....	8	2	1
Va. State Fert. Co.'s Battle Ax Tobacco Guano.....	8	2	2

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash.
Va. State Fert. Co.'s Game Cock Special Guano....	8.50	2	2
Va. State Fert. Co.'s G. E. Special Tobacco Grower..	8	2.50	2
Va. State Fert. Co.'s Bull Dog Soluble Guano.....	8	3	3
Va. State Fert. Co.'s Buffalo Guano.....	8	2.50	3
Verner Oil Co., Lattimore, N. C.—			
Cotton-seed Meal	..	8	..
S. C. Vann, Franklinton—			
Pilot Guano Special 4 Per Cent.....	10	2.50	4
Winfield Peters Co., Baltimore, Md.—			
Brighton for Tobacco.....	8	2.50	3
Williams & Clark, N. Y., Charleston, S. C.—			
Americus Ammoniated Bone Superphosphate.....	8	2.25	1
T. W. Wood & Sons, Richmond, Va.—			
Wood's Lawn Enricher	5	3	3
Standard Vegetable	8	3	3
Standard Potato	8	3	5
Standard Grain and Grass.....	8	2	2
Wood's Pure Animal Bone Meal.....(Total)	23	3	..
S. H. Ward & Sons, Jamestown, N. C.—			
Pure Bone Meal.....(Total)	20	4.50	..
W. H. Worth & Co., Raleigh, N. C.—			
Neuse Acid Phosphate.....	10	..	..
Standard Ammoniated Guano.....	8	2.50	3
Texas Bone and Potash.....	11	..	5
Union Acid Phosphate.....	14	..	..
Guilford Acid Phosphate.....	13	..	..
Salic Acid Phosphate.....	12	..	..
Nylic Acid Phosphate.....	10	..	..
Ocala Ammoniated Guano.....	8	2	2
Apex Ammoniated Guano.....	8	2	1
Worth's XXX Guano.....	8	3	3
Bone and Potash.....	10	..	2
John Whann & Son, Philadelphia, Pa.—			
5 Per Cent Guano.....	7	5	5
Our Brand Raw Bone Phosphate.....	9	2.25	2.50
H. Weil & Bro., Goldsboro, N. C.—			
Genuine German Kainit.....	..	..	12

IV.—ANALYSES OF FERTILIZERS FOR FARMERS.

The Department has made analyses free of charge for the farmers of the State for a great many years. It desires to continue to be of service in this way, but because of the large increase in the amount of work of this kind and the way samples are taken, it has been found necessary to revise the regulations under which analyses are made. The directions heretofore for taking samples have required that two parties witness the drawing and sealing of the sample. The change in the regulations, as printed below, requires that the seller or other agent of the manufacturer have an opportunity to witness the drawing of the sample to see that it is fairly done. This is fair to both the manufacturer and to the farmer, as it removes doubt as to the samples representing the goods—a point which is always raised when a farmer's sample falls below the guarantee, and the manufacturer is called upon to reimburse the farmer for the shortage. It is to be further borne in mind that a sample, to fairly represent a lot of goods, must be drawn from a reasonable number of sacks, as indicated in the instructions below.

These instructions, with blank form for sending the sample, may be had on application to the State Chemist.

DIRECTIONS FOR SAMPLING FERTILIZERS.

The Department makes analyses of fertilizers for farmers of North Carolina without charge, provided samples are taken according to these directions and the following conditions are complied with:

1. The sample must be drawn in the presence of the agent, seller, dealer or some other representative of the manufacturer.

2. Where the agent, seller, dealer or other representative of the manufacturer refuses to witness and assist in the drawing of the sample or to appoint some one to represent him, two reliable witnesses may do so.

3. The sample must be taken from not less than five sacks and from at least one additional sack for every ten sacks over five.

4. The sample should be drawn, if possible, at the time of purchase or within ten days after purchase.

Draw samples as follows:

1. For official analysis, fertilizers are sampled by the regular inspectors, by a long curved blade similar to the seed or sugar tester. Where possible use a two-foot iron sampler as above, and sample the number of bags indicated above. Thrust the sampler into the bag, withdraw and mix carefully together with similar portions from other bags. If a regular sampler cannot be procured, use the following method:

2. Provide a tea-cup, some large papers, and, for the sample, a glass fruit jar or tight tin can or box, holding about one quart, that can be tightly closed—all to be clean and dry.

3. Open the packages that have been weighed and mix well together the contents of each down to one-half its depth, emptying out upon a clean floor if necessary, and crushing any soft, moist lumps in order to facilitate mixing,

but leaving hard, dry lumps unbroken, so that the sample shall exhibit the texture and mechanical condition of the fertilizer.

4. Take five (5) equal cupfuls from different parts of the mixed portions of each package. Pour them over one another upon a paper, intermix again thoroughly but quickly to avoid loss or gain of moisture. (Special care should be observed that the sample neither gains nor loses moisture during the sampling or sending, as may easily happen in extremes of weather, or from even a short exposure to sun and wind or from keeping in a poorly closed vessel). Fill a can or box from this mixture, close tightly, seal in the presence of witnesses, label plainly and send, charges prepaid, to STATE CHEMIST, RALEIGH, N. C. Mark on the package: Sent by ..... (giving name and post-office).

5. If it is desired, the name of the brand and guarantee may be omitted from this form. But both must be sent to the State Chemist after the sender of the sample receives the analysis.

Samples, when accepted, will be entered upon our register in the order of their coming and analyzed in their turn. The results of each analysis, as soon as completed, will be promptly communicated to the person sending the sample. There is likely to be delay in analyses, especially in the spring of the year, when the official samples drawn by inspectors are being worked.

FORM FOR SENDING FERTILIZER SAMPLES AND CHEMICALS.

Analysis No.....:.
(To be left blank).

Date.....

STATE CHEMIST,
Raleigh, N. C.

DEAR SIR:—I send you to-day, marked ....., contained in a ....., a fair sample of a lot of fertilizer, drawn and witnessed according to directions on opposite side of this sheet, of the following fertilizer:

Weight branded on each bag or package.....pounds.
Actual weight of one bag or package.....pounds.
(Name of brand and manufacturer's guarantee may be retained, if desired, until analysis is returned).
Name of fertilizer.....
Manufactured by .....
At .....
Purchased of or received from.....
At .....
Selling price per ton, bag or barrel, $ .....

Give the amounts of the following ingredients as branded on the bags:

Available (or soluble and reverted) phosphoric acid..... per cent.
Nitrogen (or ammonia), if claimed..... per cent.
Potash, if claimed..... per cent.

My reasons for supposing this fertilizer is below its guarantee are:

.....
.....

Name .....
Post-office.....

HAIRY OR SAND VETCH AND BUR CLOVER.

BY

B. W. KILGORE, STATE CHEMIST;

C. B. WILLIAMS, ASSISTANT CHEMIST;

R. W. POU, SUPERINTENDENT EDGECOMBE TEST FARM.

THE NEED OF SOIL-IMPROVING PLANTS.

There is no question before the North Carolina farmer to-day, or the farmer of any of the older States, of more immediate and far-reaching importance than that of the maintenance and increase of soil fertility. Many of our fields have been long in cultivation, some of them for the second and third time after having been thrown out and allowed to grow up from one cause or another. Much plant food has been removed in the crops taken off, the land has been subjected to washing from the surface and to leaching and to the destruction of vegetable matter by the almost continuous growing of cotton, corn, tobacco and other clean cultivated crops, which return but little to the soil and leave it exposed to the heavy rains of winter and to much hot sun in the summer. These conditions are not peculiar to North Carolina alone, but prevail throughout most of the older States, particularly in the cotton-growing States. Even the great grain and hay-growing States of the Middle West are feeling the effect of the continuous production of these crops which draw heavily on the soil and return comparatively little to it. The rapid growth of the use of commercial fertilizers in amount and extended territory is evidence of the need of help to make the land keep up accustomed yields. States that scarcely knew a few years ago what a fertilizer was are now using it in yearly increasing amounts. In this State the farmers' fertilizer bill this year will be about eight million dollars ($8,000,000), the heaviest, by far, in the history of the use of fertilizers. Three millions or more of the eight millions (we estimate $3,200,000) will go for the purchase of materials supplying nitrogen (or ammonia), as cotton-seed meal, dried blood, tankage, fish scrap and nitrate of soda, for use alone or in mixed fertilizer of the manufacturers' or farmers' making. These are the highest-priced materials entering into fertilizers, and their value rests almost entirely on their content of nitrogen. Many have paid this season for cotton-seed meal by itself or in mixed fertilizers $30 per ton. With meal containing 6.6 per cent nitrogen, equaling 8 per cent ammonia, and allowing $4 for the 4 per cent of available phosphoric acid and potash in the meal, the nitrogen, the main and other fertilizing constituent, costs nearly 20 cents per pound. In the air, resting over every acre of land, there are about 75,000,000 pounds of this most costly nitrogen, and the continuous movement of the air brings from uncultivated areas new quantities of nitrogen, so that the supply is inexhaustible, and the value, on basis of the cost of the materials furnishing it in fertilizers, is incalculable. But most farm crops, as cotton, corn, tobacco, the grains, grasses, etc., cannot use this nitrogen in the form or condition in which it exists in the air in their growth. It must be supplied

to them through the soil in cotton-seed meal, dried blood, tankage, fish scrap, farmyard manure, and other animal or vegetable substances, which, on their decay in the soil, have their nitrogen changed to nitrate of soda or compounds of a similar nature. It is in this way that most crops must get their nitrogen.

There are, however, some plants—the leguminous or pod-bearing ones—as the cowpea, crimson, red and other clovers, soy beans, garden beans, English peas, alfalfa, the vetches, etc., which are able to make use of the free nitrogen of the air in their growth, and after they die and their roots, stubble, leaves and stems decay in the soil the nitrogen in them and which they extracted from the air is available for other farm crops the same as the nitrogen in farmyard manure and the fertilizer materials mentioned above.

To this class of plants belong hairy or sand vetch and bur clover, which are being specially considered in this report. They can obtain a large amount of the nitrogen they need (and which costs 15 to 20 cents a pound in fertilizers) from the air, where it costs nothing.

Our rather extensive field experiments (the results of which we need not quote here) on the different soils of the State with various farm crops show that nitrogen is, as a rule, the most needed constituent in the fertilizers applied. Its main office in plant growth is the production of a large, green, vigorous plant, without which a profitable crop cannot be made. Though it costs per pound three or four times as much as phosphoric acid and potash—the other valuable constituents of fertilizers—the profits from its liberal and judicious use are generally greater than from the less expensive constituents.

The condition of our soils, because of long cultivation in soil-exhausting crops, the need of fertilizers to bring about profitable yields, and the large expenditure for fertilizers, emphasize the need of growing soil-improving crops—ones which will obtain nitrogen from the air.

HOW VETCH, BUR CLOVER, COWPEAS, ETC., IMPROVE THE SOIL.

It has long been known in the Southern States that the cowpea increases the productiveness of land on which it is grown. This is now known to be due to the fact that the cowpea is able to obtain large amounts of nitrogen from the air. It cannot do this by itself, but has to have the aid of the extremely minute organisms, germs, or bacteria, which live in the enlargements, nodules, or tubercles growing on the roots of the cowpea plant. An examination of the roots of the cowpea will show these enlargements to be almost always present. They are small at first, but attain the size of large shot, and are roundish in shape. It is within these nodules that the bacteria live which are able to get the nitrogen from the air in the pores of the soil and put it in such form that the cowpea can use it in its growth. In the same way hairy vetch, bur clover and other plants of this class increase the productiveness of the soil on which they grow.

On pages 654 and 656 (Figs. 1 and 2) are illustrations from photographs of the roots of hairy vetch and bur clover, respectively, showing on their roots the nodules which contain the bacteria enabling them to obtain their nitrogen from the air.

FIG. 1.—NODULES ON ROOTS OF HAIRY VETCH, EDGECOMBE TEST FARM, MAY, 1903.

NECESSITY OF PROPER BACTERIA INOCULATION.

When the cowpea is carried to a section of country where it has not grown before, it is generally a failure at first, unless the land is productive enough to grow a good crop of any kind, because the cowpea bacteria are not in the soil. When crimson clover was introduced into the State some ten or twelve years ago, it was reported to be a failure for several years by a large number of those attempting to grow it, especially on the eastern sandy lands where clover had not been grown before. This was on account of the necessary bacteria for its best development not being in the soils. The crop was frequently noticed, when grown on the same land for a number of years in succession, to greatly improve each year. Its kind of bacteria had gotten into the soil and was becoming more plentiful. A small plat of crimson clover on one of the Test Farms in 1901 grew little more than 6 inches high. The second year, after applying a dressing of soil from a field which grew good crimson clover with an abundance of nodules on the roots, a good growth two and one-half to three feet high was obtained, with plenty of nodules on the plant roots. This same plat produced in the summer of the first year at the rate of fully one and one-half tons of peavine hay per acre, but not enough clover to cut, though both crops were fertilized alike. The cowpea roots had plenty of nodules on them. Its kind of bacteria was in the soil. Crimson clover required a different bacteria from the cowpea and its kind was not in the soil at first, but was carried there in the soil from the successful crimson clover field.

On page 660 (Fig. 4) is an illustration from a photograph of vetch grown the first year on coarse sandy land. This area had soil from a successful vetch field broadcasted with the seed at the rate of 200 pounds per acre. A few of the plants had a limited number of nodules on their roots and made a small growth, but the greater portion of them had no root nodules and dried up in the hot sun without getting large enough to be seen in the photograph. The vetch was not large enough to be cut and would not have yielded over 200 to 300 pounds hay per acre. Peas followed the vetch in the summer, and produced fully 1½ tons hay per acre. The small growth of vetch reseeded itself in part, and more seed were sown in the late summer, and the yield of vetch hay the second year, in early June, was over 2½ tons per acre (5,100 pounds). This weight was from a small area, which seemed to be an average but probably was too large, the yield as obtained on large areas on this type of land being generally 1½ to 2 tons hay per acre. A photograph of this second year's growth is reproduced on page 662 (Fig. 5).

There were no vetch bacteria in this soil at first, but plenty of those living on the cowpea roots. A start was made by adding soil from a field on which vetch grew successfully and with an abundance of nodules on its roots. These vetch bacteria had so multiplied in the soil by the second year as to produce a good crop and to make the difference between success and failure.

This means that each kind of leguminous or soil-improving plant needs its own peculiar bacteria, though the same bacteria will grow on the roots of plants closely akin, as on wild or smooth and hairy vetch and the garden or English pea; but the one that helps the cowpea to get its nitrogen from the air will not do the same work for vetch, clover, etc. Vetch, bur clover, crimson clover, the cowpea, soy bean and other distinct species of leguminous

FIG. 2.—NODULES ON ROOTS OF BUR CLOVER ON LEFT AND ALFALFA ROOT IN BUR CLOVER BUR ON RIGHT, SHOWING NODULE AT 1 AND BUR AT 2.

plants, each has its own species of nitrogen-growing bacteria, and if not present in the soil already or gotten there in some natural way in the course of long growing of the crop, as is generally the case with the cowpea in the Southern States, the bacteria needed by the legume to be grown must be added in some artificial way before the crop can be grown successfully. *The process of adding a new kind of bacteria to a soil is known as inoculation. It must be borne clearly in mind that without nodules carrying bacteria on the roots of leguminous plants there is no real soil improvement.* The cowpea without its bacteria could not get any nitrogen from the air and would not improve the soil any more than cotton, corn or oats, but would exhaust it as these crops do when removed in like way. It is necessary, then, to inoculate or get new kinds of bacteria into our soils for new leguminous crops like vetch, bur clover and alfalfa.

HAIRY VETCH: ITS GROWTH AND USES.

Hairy or sand vetch (*Vicia villosa*, Roth). Annual, much branched both at the base and at different points along the stem; ten to fifty branches; stems trailing, angled, grooved, nearly square; hairy when young, smoother when old; stems three to six feet long. Leaves composed of six to nine pairs of leaflets, the end one and one or two pairs replaced by tendrils, leaflets narrow, ⅛ to ¼x¾ to 1 inch, hairy, margins not notched; stipules ⅛ to 3-16 long, arrow-shaped. Flowers bluish purple, ½ to ⅝ inch long, produced in one-sided racemes of 20 to 28. Stems of the racemes 1¼ to 1½ long. Pods flattened, ⅜x1¼ inches, five or six being produced for each raceme of flowers, usually four to five seeded; seeds black, round, 3-32 to 5-32 inch in diameter. Nitrogen tubercles in roundish masses, forked and divided.

Native of Europe, introduced in America about 1847.

METHODS OF INOCULATING HAIRY VETCH.

There are a number of ways of getting new bacteria into soil. In the case of vetch the following may be employed:

The Use of Soil from Vetch or English Pea Fields.—By bringing soil from a field which has grown hairy vetch successfully with the production of nodules on its roots and broadcasting or drilling with the seed. Nothing will be gained from the use of this soil unless nodules are developed on the roots of the vetch, showing that the vetch bacteria are present. The first three to four inches of soil should be taken to get the largest number of bacteria. The soil may be shipped in bags as fertilizer and may be kept for several months before use, but should be stored in a cool, shady place not exposed to the sun, as too much heat and sunlight kill the bacteria. The soil should be put out in the early morning, late afternoon or during a cloudy time or just before a rain, and should be covered thoroughly at once. When put out with the seed, which is best, it may be covered with and in the same way the seed are. Or, after the vetch is up the soil may be broadcasted and worked in with a weeder or "peg-tooth" harrow when the crop is small, or it may be sown just before a rain, which will distribute and mix the vetch soil with the main soil. These precautions in applying the soil are more necessary in hot, summer weather than in the winter, when the soil is cool and moist and the sunlight not so strong. Two hundred to three hundred pounds of soil per acre will be suffi-

FIG. 3.—STEM, FLOWERS AND SEED PODS OF HAIRY VETCH.

cient to give a start of the bacteria, so that they will usually develop in sufficient numbers for a fair crop the second year and a good one the third. To insure a good inoculation the first year there will be required from 1,000 to 2,000 pounds or more of soil, according to the character of the land, and it is best to drill it with the seed with a grain drill, but it is safest not to mix fertilizer with the inoculating soil, unless the quantity of fertilizer be very small.

In many sections of the State, particularly in the eastern portion, common or smooth vetch, frequently called "partridge pea," grows well on roadsides, in fence corners, on ditch banks and in old fields and waste places. The soil from these places may be used successfully for inoculating hairy vetch, as the bacteria which produces the nodules on the roots of one will do so on the other, the plants being very close akin. We have obtained splendid inoculation on twenty-five acres of hairy vetch on our Edgecombe Test Farm by the use of the soil on which the wild vetch grew. This has come about in three years by the use of about 300 pounds of soil the first season. The hairy vetch is a stronger, hardier, more vigorous and valuable plant than the wild vetch, and would grow splendidly in a great many pasture fields now producing wild vetch, and would give much better results. The inoculation already in these soils, with an application of acid phosphate and potash salt, would insure a good crop of hairy vetch.

The vetches and the English or garden pea are closely related, and the soil from a garden or field where the English pea has grown for a number of years and produced nodules can be used for inoculating vetch, or it can be grown upon the same soil where the area is large and it is desired to produce this crop.

The Use of Soil Extract.—A second method of inoculation where the soil is scarce or has to be transported a long distance is to use a bushel or more of soil from some of the sources indicated above. Put it in a tub or barrel and add to it sufficient water to thoroughly wet it and to leave, after the soil settles, sufficient water to moisten the seed to be sown. Mix the soil and water thoroughly, and after the soil has subsided dip the seed in the water, using a coarse bag of some kind for holding them, or else pour the water in a vessel containing the seed and mix until all of the seed are moist; spread the seed on a floor or canvas, and after they are thoroughly dry, sow in the usual way. This is known as the soil extract method of inoculation, but in our experience has not been so safe or satisfactory as the use of the soil itself in the quantities indicated above.

The Use of Artificial Culture Material.—A concentrated culture of vetch bacteria is prepared by the United States Department of Agriculture for inoculating vetch. In this a large number of the bacteria are grown in a material suitable for their development. They are sent out in this way and made to further increase in numbers just before use by mixing with water and handling according to instructions furnished. The seed are moistened with this water and the same course followed as in the soil extract method above.

Natural Method of Inoculation.—Vetch bacteria are absent from most North Carolina soils. It is desirable to add them in one of the ways indicated above and absolutely necessary to have them present for the successful production of the crop. Where it is not convenient or possible to obtain the material for

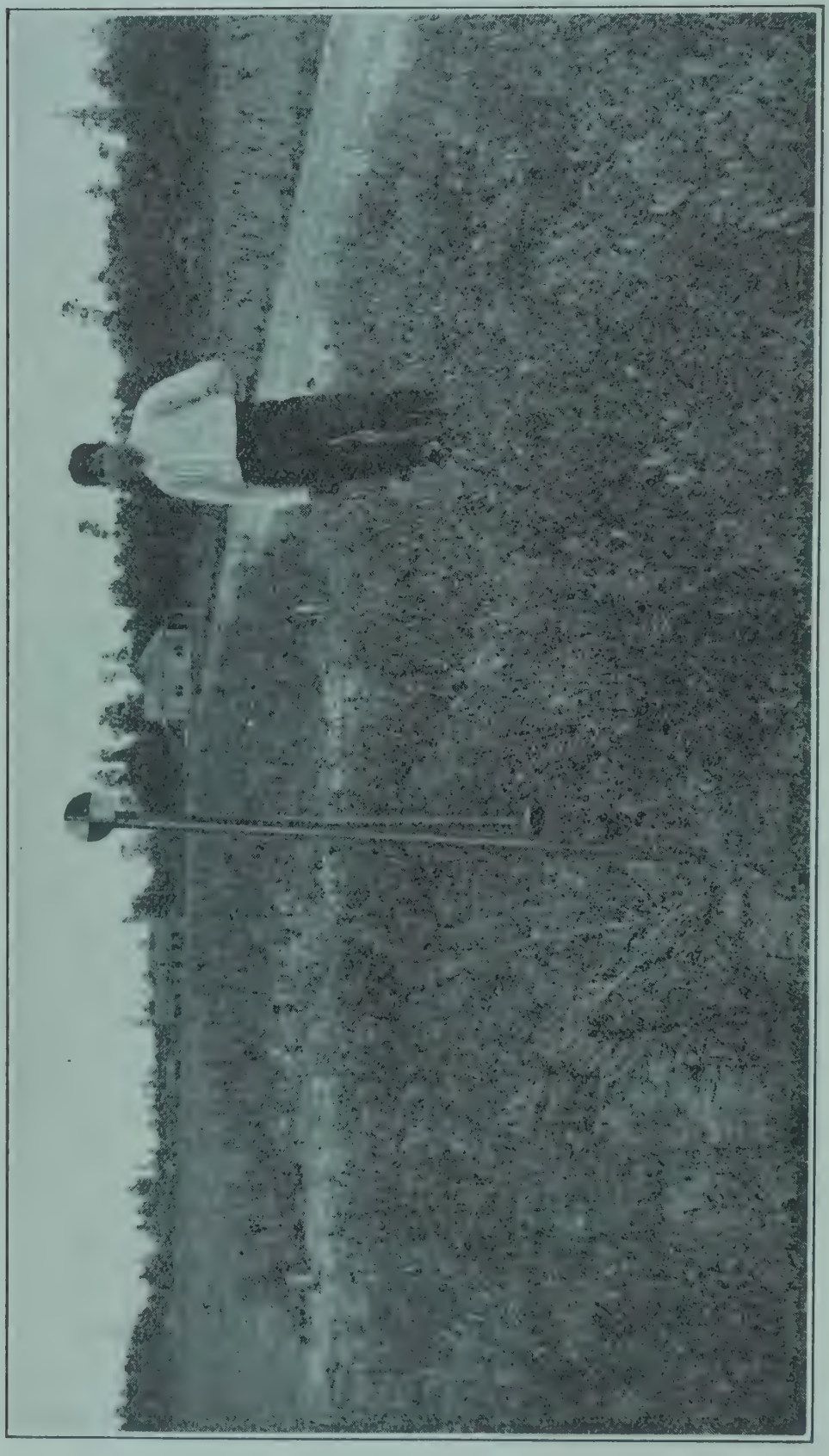


FIG. 4.—HAIRY VETCH FIRST YEAR, WITH BUT FEW PLANTS INOCULATED.

artificial inoculation, by planting vetch on the same land for a number of years in succession, or allowing it to reseed itself, as it will do on fairly good land if opportunity is afforded, vetch bacteria will gradually get into the soil in a natural way, or else some of the bacteria which develop on the roots of other leguminous crops will be so modified as to grow on the roots of vetch. In our experiments where no inoculation was attempted we have noticed that usually in the second year a considerable number of plants have nodules on them, and a few even during the first year. By the third or fourth year the number of bacteria are usually sufficient for fair and good crops. This is a slow process, however, and more is generally lost in the first and second year's crops in reduced yield than the cost of inoculation would come to.

Before the cowpea was grown on our soils there could have been no cowpea bacteria in them. With the growth of this plant these bacteria were added in some way by nature, or else the bacteria of some other plant adapted itself to the cowpea. After a soil once has the bacteria of a certain kind in it, it increases very rapidly with the cultivation of the crop on which it thrives and becomes distributed through the soil by surface and drainage waters, the transportation of soil on agricultural implements from one field to another, by wind and the dust which it carries, and in other ways.

In this way a new kind of bacteria spreads to adjoining areas, when its growth is encouraged by the production of plants on which they develop.

In beginning the growth of vetch or any other leguminous plant it is well to inoculate a small area, when the soil from this, after two or three years, will furnish an abundance of material for putting out other areas. By planting ahead in this way, inoculation need not cost much in either labor or money.

Does it Pay to Inoculate?—That it pays to inoculate vetch is very clearly shown in contrasting Figs. 4 and 5, already referred to. In Fig. 4 there was almost no inoculation, and the growth was not sufficiently large to cut for hay; while in Fig. 5, on the same type of land, the yield of hay was over 2½ tons per acre after inoculation.

HAIRY VETCH FOR SOIL IMPROVEMENT, FOR HAY AND FOR PASTURAGE.

Hairy Vetch for Soil Improvement.—It has been known for a great many years that leguminous plants, such as the vetches, cowpeas, clover, etc., have a decided influence in materially increasing the yield of subsequent crops, but the reasons for this improved condition of the soil have only been revealed within quite recent times by the discoveries of such eminent scientific workers as Hellriegel, Nobbe, Wilfarth, Lawes and Gilbert, Atwater and Boussingault and Ville.

In our experimental work in the Department of Agriculture, we have recognized that one of the most, if not the most, important problem was to obtain some soil-improving crops which would supplement the work of the cowpea by growing and enriching the land during the fall, winter and spring months. In hairy vetch we have such a plant. The average fertilizing value of the hay of this legume, as a result of two years' growth on the Edgecombe Test Farm, as shown in Table I, is $25.12 per acre. Of this amount 85.8 per cent is due to the nitrogen content alone, the principal part of which was derived directly from the air through the intervention of micro-organisms contained in the nodules on the roots of the plants. With corn producing 24.2 bushels of shelled

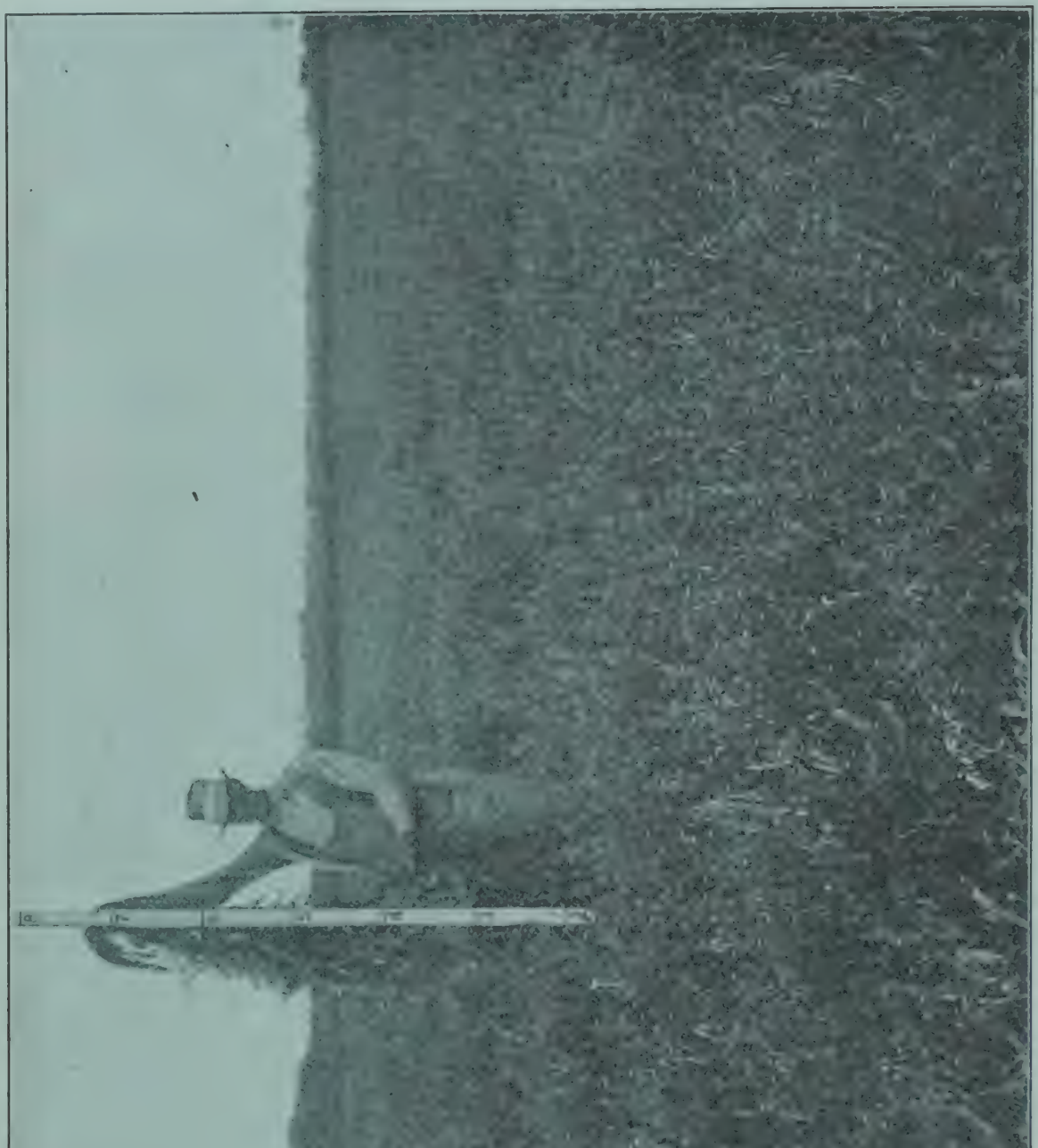


FIG. 5.—HAIRY VETCH (VOLUNTEER CROP) AFTER INOCULATION ON SANDY LAND, EDGECOMBE TEST FARM, MAY 13, 1902. (PLATE 3-109)

corn per acre, grown on the same farm on the same type of soil, with practically the same fertilization, it was found, as an average of two years—1902, 1903—that the stalks, leaves, ears, shucks, etc., cut with a harvester contained fertilizing constituents to the value of $12.12, when assigned the values that are used in mixed fertilizers this year in this State. About 78 per cent of the value of the fertilizer constituents in the corn plant is nitrogen, which was derived entirely from the storage of nitrogen in the soil, as this class of plants is unable to secure any nitrogen from the atmosphere.

By consulting Table 1 it will be seen that as an average of two years' experimenting with hairy vetch it has been found that 86.3 per cent of its total nitrogen is in that portion of the plant that is cut for hay, while 13.7 per cent is left in and on the ground in the form of roots, stubble, fallen leaves, etc. Of the total fertilizing constituents 88.8 per cent is in the stems, leaves, flowers, etc., and 11.2 per cent in the roots, stubble, fallen leaves, etc., or that portion of the legume left in the field after removing the hay. Again comparing the corn and hairy vetch, as the average of two years' growth, under practically identical soil and fertilizer conditions, it is noted that the corn producing 24.2 bushels of shelled corn and 2,167 pounds of stover only removed about one-half as much phosphoric acid and a little more than one-third as much potash per acre as 2.03 tons of hairy vetch. From this it is seen that vetch grown for hay draws pretty heavily upon the mineral plant-food constituents of the soil, which fact emphasizes the great importance of preserving the manure from the hay fed to farm animals and putting it back on the soil. It will be found that the manure from a rich feeding material like hairy vetch will be a great deal richer in plant food than the manure from grass hay or corn. The roots and stubble of a crop like vetch, when allowed to decompose in the soil, not only add plant-food to the soil, but improve the mechanical condition of the soil, making open soils more compact and retentive of moisture and fertilizing materials applied, and compact soils more open and earlier. In both types of soil the humus added in this way will liberate a considerable quantity of the inert plant-food therein contained for the use of succeeding crops.

The main value of vetch as a soil-improver is due to the large amount of nitrogen which it annually collects from the air and adds to the soil. As an average of two years' experiments on our Edgecombe Test Farm, 132.5 pounds of nitrogen were found to be present per acre in the entire plant. This is equal to almost exactly one ton of cotton-seed meal containing 8 per cent ammonia. This fact itself emphasizes the importance of this crop as a soil-improver, as this quantity of cotton-seed meal the past season would have cost anywhere from $25 to $30.

Hairy Vetch for Hay.—The most important and costly constituent in feeds for domestic animals is protein. The chief value of protein is for the production of lean meat and for increasing the flow of milk. It is protein that gives to cotton-seed meal its high feeding value. Vetch is very rich in this constituent, containing, as an average of two years' growth, 17.4 per cent protein. Cowpea-vine hay contains 14.5 per cent; crimson clover, 15 per cent; wheat bran, 15.5 per cent. The value of these latter hays as feed is fully recognized.

It will be seen that vetch is richer in protein than any of these three materials. Feeding experiments at the Alabama Experiment Station (Bulletin No. 123) show that vetch is fully equal, pound for pound, in feeding value with wheat bran, and that very little is left unconsumed, the waste amount-

TABLE I.—WEIGHT, COMPOSITION AND FERTILIZING VALUE OF AIR-DRIED HAIRY VETCH.

Legume.	Weight of Air-dried Crop in Pounds per Acre.	Percentage Composition.				Weight in Pounds of Fertilizing Constituents per Acre.			Value of Fertilizing Constituents per Acre.			Total Value Fertilizing Constituents.
		Moisture.	Phosphoric Acid.	Potash.	Nitrogen.	Phosphoric Acid.	Potash.	Nitrogen.	Phosphoric Acid.	Potash.	Nitrogen.	
1903.												
Hairy Vetch, stems, leaves, pods and blooms	5,100	9.08	1.11	2.65	2.78	56.61	135.15	141.78	$ 2.25	$ 7.43	$ 28.36	$ 38.34
Hairy Vetch, roots and 2-inch stubble	2,262	4.68	.45	.71	1.36	10.18	16.06	30.76	.46	.88	6.15	7.49
Total	7,362					66.79	151.21	172.54	3.01	8.31	34.51	45.83
1904.												
Hairy Vetch, stems, leaves, pods and blooms	3,020	9.07	.51	2.70	2.77	15.40	81.54	83.65	.69	4.48	16.73	21.90
Hairy Vetch, roots and 2-inch stubble	715	4.84	.28	.59	1.25	2.00	4.22	8.94	.09	.23	1.79	2.11
Total	3,735					17.40	85.76	92.59	.78	4.71	18.52	24.01
Average for two years { Stems, etc.	4,060	9.08	.81	2.68	2.78	36.01	108.35	112.72	1.62	5.96	22.55	25.12
Average for two years { Roots, etc.	1,489	4.76	.37	.65	1.31	6.09	10.14	19.85	.28	.56	3.97	4.80

ing to only 6 per cent. On the basis of money value, these experiments show that when wheat bran was worth $20.00 per ton vetch was worth $20.00 and cowpea-vine hay $17.20.

It is only necessary to add to this that all classes of animals eat it readily. Considering the fact that it grows during the fall, winter and spring months, when too much of our land is bare, its more extensive cultivation for use as hay cannot be too strongly urged.

Vetch for Pasturage.—Vetch furnishes excellent pasturage for horses, cattle, sheep and hogs. After it is established on the land and comes up each year as a volunteer crop, a considerable amount of grazing will frequently be furnished in the fall months, when the season is mild—in November and December. It remains dormant during the cold winter months, but comes out with the first warm days of spring and will usually be large enough for grazing by the first of March, and can be grazed until the first of April or later, and then will produce a good crop of hay or seed. This year on the Edgecombe Test Farm the vetch was grazed until April first, and then produced 1½ tons of hay per acre by May 20th. The smaller yield of hay in 1904, as shown in Table I, over 1903, was likely due to the late grazing. Even with this the yield was satisfactory. Where it is not desired to produce hay or seed the vetch may be grazed until the first of June in this State; but stock should be removed about April first, to give the plant a chance for hay or seed production, when hay or seed is wanted.

It grows well on Bermuda sod, in connection with which it will furnish grazing during the greater portion of the year. By broadcasting the seed and scarifying the sod, a stand will usually be obtained which will not need to be reseeded afterwards if opportunity is given, as indicated under "Reseeding," for the maturity of seed. It grows well in combination with a number of other plants for grazing, notably lespedeza or Japan clover. The growing habits of Japan clover and Bermuda fit into each other very nicely for grazing crops.

SOIL.

We have found vetch to grow well on most of the type soils of the State, and it will likely make this satisfactory growth on all of them where there is reasonably good drainage after inoculation has been obtained. The greater portion of our experience with it has been in the eastern part of the State on sandy land, where it has made a most satisfactory growth. It does well on red clay lands and on valley lands. It will not thrive well on wet and acid soils. On the Edgecombe Test Farm it has died out or refused to grow where the land was quite acid, which has necessitated liming to correct the acidity. The lime was applied at the rate of 500 pounds per acre broadcast. It does not, however, require a soil rich in lime for its development. It will make a good growth on much poorer and lighter lands than the clovers, which enables the growth of a soil-improving crop in many sections of the State where clover cannot be grown to advantage.

PREPARATION OF SOIL AND SEEDING.

The land may be prepared for vetch as it would be for wheat, oats or other grains. Because of its growing habit (the forming of long running stems, which will not support themselves) it is well to sow it with wheat or oats

FIG. 6.—(a) TOPS (ABOVE) AND ROOTS AND STUBBLE (BELOW) OF BUR CLOVER FROM 1 SQUARE YARD. (b) TOPS (ABOVE) AND ROOTS AND STUBBLE (BELOW) OF HAIRY VETCH FROM 1 SQUARE YARD.

when grown for grazing and hay. Oats, wheat and vetch reach the hay stage, as well as the ripening period, about the same time, and the support which the grains give the vetch makes it easier to harvest. These mixtures make excellent hay and may be cut for seed and saved together, though the seed cannot be separated afterwards. This does not possess any special disadvantage, however, as the mixtures may be used again for seed, and there is ready sale for them. When sown alone one bushel of vetch will be required the first year. The cost of seed is rather a serious obstacle to the extensive growing of vetch, as they cost from $4 to $8 per bushel of sixty pounds. Fifteen to twenty pounds of vetch with 1½ bushels of oats or a bushel of wheat will give a good stand the first year and produce an excellent crop of hay.

Vetch or mixtures of vetch and oats or wheat may be sown in cotton during September and covered lightly with a harrow or cultivator, using short singletree to prevent injury to the cotton. A good time to sow in cotton is just after the first picking. After corn has been cut and shocked in the field these mixtures may also be cultivated in, or they may be planted on, other land at the time of sowing fall oats.

Vetch may be sown from the middle of August to the first of October, and possibly in the eastern part of the State as late as the middle of October. September—when there is a good season in the ground—is considered the best month for sowing. The seed should be covered in about the same way as oats and wheat.

RESEEDING.

While the cost of vetch seed is an obstacle to its growth it reseeds itself readily when properly handled. Where it is being grazed if stock are removed for a few weeks sufficient seed ripen for reseeding the land. For hay it is best cut in the early flowering stage, after which it will put out sufficiently to form seed enough for reproducing itself; or it may be cut at a more mature stage, when there will be sufficient matured seed left for reseeding, though the hay will not be so good. Where the crop is harvested for seed there will always be enough scattered seed remaining for a future crop. The seed will remain on the ground until the rains of early fall cause them to germinate. The land should be turned reasonably early to prevent birds from getting the seed.

FERTILIZATION.

As vetch, after the soil on which it is to be grown has become thoroughly inoculated, gets the greater portion of its nitrogen from the air, only phosphoric acid and potash need be used in the fertilizer, though until inoculation is secured some nitrogen will need also to be applied in the fertilizer. Two hundred to four hundred pounds per acre of the following mixture will give good results:

Acid phosphate	200 pounds.
Kainit	100 pounds.

VETCH IN ROTATION WITH OTHER CROPS.

Peas, sorghum, corn and other late crops may follow vetch. After these crops are "laid by," the vetch will come up frequently sufficiently early to give some fall grazing after the other crops are removed. Cotton and corn may

FIG. 7.—BUR CLOVER STEM, SHOWING LEAF, BUR AND FLOWER DEVELOPMENT.

be grown in connection with vetch in a similar way to that indicated in the discussion of bur clover, though the vetch will be somewhat more difficult to handle, on account of its larger growing habit and later maturity. We have grown these crops very satisfactorily in this way.

On account of its improvement of the soil, the protection of the soil in winter and its value for hay and grazing, considerable trouble can be taken to keep it in rotation with other crops on the farm. The value of vetch in these ways and the fact that it can be kept on the land without cost for seed after the first year make it a highly desirable crop. Its reseeding itself gives it an advantage over crimson clover and many other leguminous crops.

BUR CLOVER: ITS GROWTH AND USES.

Bur clover (*Medicago maculata*, Sibth). Annual, much branched, fifteen to sixty branches at the base, ascending and spreading, smooth; stems fifteen to thirty inches long. Leaves petioled, three-parted; leaflets broad at the apex, pointed at the base, emarginate, cuneate, wavy margin, ⅜x½ inch; stipules small, dentate. Flowers yellow, ⅛ inch long, in small heads of two to four. Pods ¼x¾ inch, spirally twisted in two to four coils; coils flat, veined, each provided with two rows of reflex prickles. Seeds three to five to the pod, ⅛ to 3-16 inch long, strongly kidney-shaped, deep yellow in color. Nitrogen tubercles forked, rather flattened, ⅛ to ½ inch in diameter.

Native of Europe and Asia, supposed to have been introduced into America in ship ballast.

The two illustrations (Nos. 7 and 8), and the printed matter give a fair idea of the growth and habits of bur clover. When the stand is thin single plants occupy considerable space, varying from 2½ to more than 4 feet square. On plants of ordinary size we have found forty or more stems, with sixty or more burs, each bur bearing three to seven seed, usually five. On this basis a single plant would have 2,400 burs and 12,000 seed.

INOCULATION OF SOIL FOR BUR CLOVER.

To grow bur clover successfully on a soil that has never grown this legume, it is generally unnecessary to resort to artificial inoculation, as the burs containing the seed after maturity fall to the ground and have to be swept up, hence enough germs will be contained in the soil that clings to the burs to insure tolerably complete inoculation when they are sown. On an uninfected piece of land, certainly the inoculation will be completed by the beginning of the second year.

The uses of bur clover are principally for soil improvement and pasturage, as it is not much of a plant for hay.

BUR CLOVER FOR SOIL IMPROVEMENT AND FOR PASTURAGE.

Bur Clover for Soil Improvement.—As shown in Table II, bur clover, as an average of two years' experiments—1903 and 1904—has produced on the fine sandy loam soil of the Edgecombe Test Farm 2.91 tons of hay per acre, the fertilizing constituents of which, at the prices assigned them in mixed fertilizers this year, are worth $36.24 per acre. Of this amount $28.27, or 78 per cent, is due to the nitrogen it contains, which was gathered principally, as with vetch, from the air through the instrumentality of bacteria inhabiting

FIG. 8.—BUR CLOVER PLANT, EDGECOMBE TEST FARM, MAY 12, 1903.

the nodules on the roots of the plants. With this legume 87.2 per cent of the total nitrogen and 89.5 per cent of the total fertilizing constituents are contained in the stems, leaves, leaf-stalks, burs, seed, etc. This leaves in the soil, after removing the tops, 12.8 per cent of the total nitrogen and 10.6 per cent of the total fertilizing constituents of the entire crop as roots and stubble.

In Fig. 9 is shown cotton following a crop of volunteer bur clover and fertilized with 28 pounds of phosphoric acid (200 pounds 14 per cent acid phosphate) and 10 pounds of potash (80 pounds kainit) per acre in the form of acid phosphate and kainit, while Fig. 10 shows cotton following cotton and fertilized with 200 pounds of acid phosphate, 80 pounds of kainit and 120 pounds of cotton-seed meal. In other words, Fig. 9 shows cotton to which the nitrogen was supplied by a previous crop of bur clover, and Fig. 10 cotton to which a complete fertilizer had been added. The plat on which bur clover supplied the nitrogen yielded 1,620 pounds of seed cotton per acre, which was exactly 400 pounds in excess of the plat receiving an application of 400 pounds of a complete fertilizer. This 400 pounds of seed cotton sold for $18, and deducting from this $2 for picking and excess hauling, we have a gain of $16 per acre in favor of the bur clover plat. It must also be remembered that this gain was made with a commercial fertilizer containing no nitrogenous material and costing 46 per cent less than that applied to the plat (Fig. 10) receiving a normal application of fertilizer. The more luxurious growth of the cotton following bur clover is readily seen by comparing the growth in Fig. 9 with that in Fig. 10. On the bur clover plat the cotton averaged from 3½ to 4½ feet high, while in the plat receiving a normal fertilizer application the average height was only from 2 to 3½ feet.

Fig. 11 shows a very productive growth of corn after a crop of bur clover in 1903. Almost every stalk bore two or more well-developed ears per stalk. The corn was planted after a crop of clover seed had been harvested. The seed left on the ground reseeded the land, which produced a good volunteer growth of clover in 1904.

We can more fully appreciate the value of this plant as a soil improver when we see from Table II, as an average of two crops on the Edgecombe Farm, that the entire plants on one acre contained 162.1 pounds of nitrogen. It would require 2,456 pounds of cotton-seed meal, containing 8 per cent ammonia, to furnish this quantity of nitrogen, which was obtained largely from the air by the clover.

Bur Clover for Pasturage.—In addition to its value as a soil improver, bur clover is an excellent grazing crop. When sown in corn or cotton at the last cultivation in July or August, it comes up in time to give some grazing in the fall. As soon as spring opens the clover puts out rapidly, sooner than most other plants, and gives good grazing from the first of March, often in February, and up to the first of April, when it is well to remove stock and give it an opportunity to produce seed and tops for soil improvement. Calves, sheep and hogs grazed our crop on the Edgecombe Test Farm until the first of April this year. By the 20th of May it had reached a height of 2½ feet, producing air-dried hay at the rate of over 3½ tons per acre. The average yield for two years has been 2.9 tons per acre. This shows how rapidly it makes its growth. Stock do not like it well at first, but as there is but little green material to be had in the winter and spring they soon become accustomed to it and graze

TABLE II.—WEIGHT, COMPOSITION AND FERTILIZING VALUE OF AIR-DRIED BUR CLOVER.

Legume.	Weight of Air-dried Crop in Pounds per Acre.	Percentage Composition.				Weight in Pounds of Fertilizing Constituents per Acre.			Value of Fertilizing Constituents per Acre.			Total Value Fertilizing Constituents.
		Moisture.	Phosphoric Acid.	Potash.	Nitrogen.	Phosphoric Acid.	Potash.	Nitrogen.	Phosphoric Acid.	Potash.	Nitrogen.	
1903.												
Bur Clover, stems, leaves, burs and blooms	4,396	8.70	.42	2.69	2.02	18.46	118.25	88.80	$ .83	$ 6.50	$ 17.76	$ 25.09
Bur Clover, roots and 2-inch stubble	704	6.79	.54	1.04	1.86	3.80	7.32	13.09	.17	.40	2.62	3.19
Total	5,100					22.26	125.57	101.89	1.00	6.90	20.38	28.28
1904.												
Bur Clover, stems, leaves, burs and blooms	7,288	8.75	.60	1.66	2.66	43.73	120.98	193.86	1.97	6.65	38.77	47.39
Bur Clover, roots and 2-inch stubble	1,558	7.07	.44	.64	1.83	6.86	9.97	28.51	.31	.55	5.70	6.56
Total	8,846					50.59	130.95	222.37	2.28	7.20	44.47	53.95
Average for two years, Stems, etc.	5,842	8.73	.51	2.18	2.34	31.10	119.62	141.33	1.40	6.58	28.27	36.24
Average for two years, Roots, etc.	1,131	6.93	.49	.84	1.85	5.33	8.65	20.80	.24	.48	4.16	4.88

it readily. It is a specially good grazing crop for hogs, sheep and cattle. Where it is only desired to have enough seed produced to reseed the clover it may be grazed until the middle of May or even later. In fact, its running habit makes it almost impossible to graze it so closely as to prevent its producing enough seed to reseed itself.

It grows well on Bermuda sod and in connection with it will give almost continuous pasturage, as the Bermuda comes up early in May, about the time the clover is giving out, and continues until frost, when the clover is beginning to furnish grazing. To start the clover on Bermuda sod broadcast the seed and scarify the sod, so as to cover them lightly.

Because of the ease with which bur clover reseeds itself, its value as a soil-improver and grazing crop, and the readiness with which it fits into rotation with cotton and corn, make it a most valuable crop for growth in connection with cotton and corn farming. Both cotton and corn may follow bur clover without the trouble or expense of reseeding the clover.

SOIL.

Our experience with bur clover has been mainly on the sandy soils of the eastern part of the State, where for the past two years it has made a most excellent growth, reseeding itself after the first sowing. It does best on the heavier types of sandy soil which are underlaid by clay subsoil, and which are generally moist, but it grows well on the lighter types of sandy soil, and will, we think, after the first year, make a satisfactory growth on most eastern soils where the drainage is fairly good. A small area has been grown one year on the clay land in the Piedmont section of the State with fairly good results, and it seems likely that it will succeed in that portion also. In the States to the south of us, it grows well on moderately stiff prairie land, which would indicate that it will likely succeed on most of the soils of this State, where the climatic conditions are favorable.

We are making experiments with it in different sections of the State, with a view of obtaining information on this point.

PREPARATION OF SOIL AND SEEDING.

Where this clover is to be sown by itself the land may be prepared as for grain or grass crops. Our experience has been mainly broadcasting the seed in corn and cotton and covering them at the last cultivation of these crops, the latter part of July or early in August. This is done by the use of cultivators, which only cover the seed one to two inches deep. This method would likely not work so well where ridge culture is followed and the turning plow is used for "laying by" the crop, as the seed would likely be covered too deeply by this method. The seed may be sown as late as the middle of September, but seeding should not be delayed beyond this, as it requires considerable time for the burs containing the seed to become sufficiently moist for the seed to germinate. When planted this late seed may be broadcasted in cotton, corn or other crops, and then worked in lightly with harrow or cultivator, using a short singletree to prevent injury to crops in narrow rows. Two bushels of seed will give a fair stand the first year, after which it will not be necessary to reseed if the crop is given proper treatment and an opportunity to mature seed, as referred to under "Reseeding."

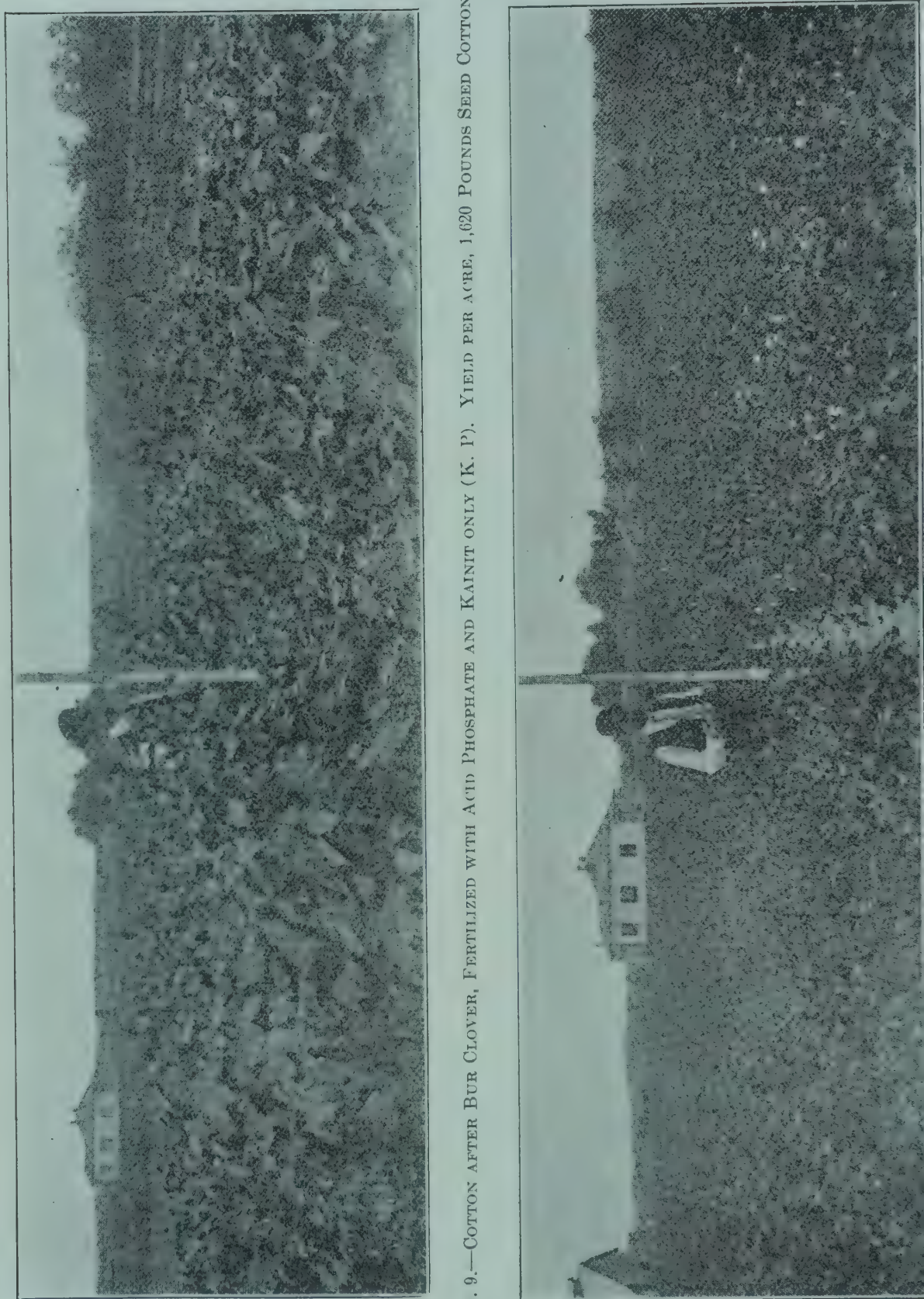


FIG. 9.—COTTON AFTER BUR CLOVER, FERTILIZED WITH ACID PHOSPHATE AND KAINIT ONLY (K. P). YIELD PER ACRE, 1,620 POUNDS SEED COTTON.

FERTILIZATION.

As bur clover gets a large amount of its nitrogen from the air it will need little or no fertilizer furnishing this constituent, especially after the first year, when inoculation has become assured. Liberal application of acid phosphate and potash in the form of acid phosphate and kainit, or some other potash salt, should be used for good results. Two hundred to four hundred pounds per acre, broadcast, of the following mixture, is advised:

Acid phosphate	200 pounds.
Kainit	100 pounds.

Twenty-five pounds muriate of potash may replace kainit with equally good results.

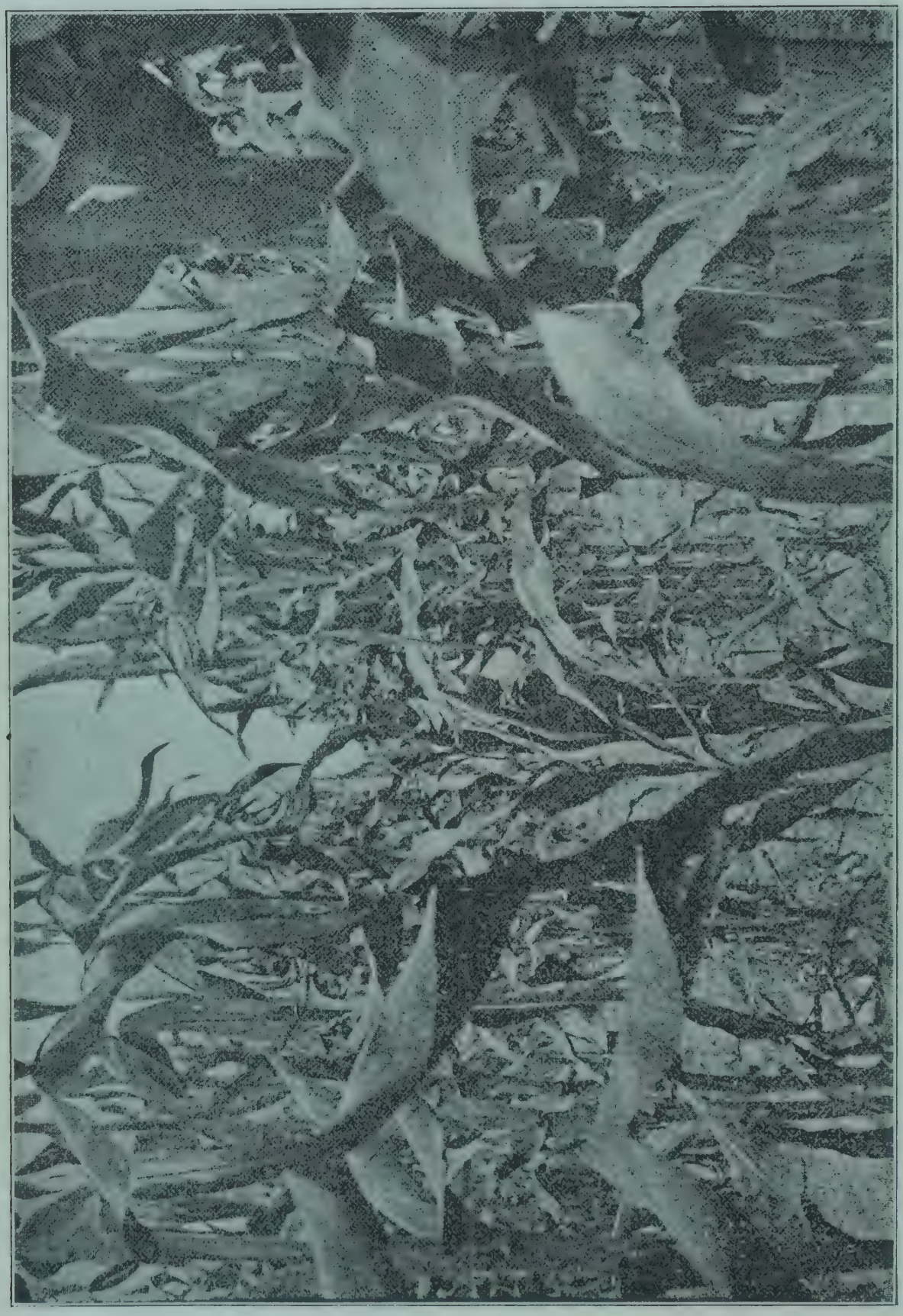
Lime.

Bur clover does not seem to require a large amount of lime, as many leguminous crops do. A good many of our eastern soils, which are not well drained, are found to be quite sour or acid, and in these the bacteria which enable the clover to get its nitrogen from the air do not develop. In such cases lime should be used at the rate of 500 to 1,000 pounds per acre to counteract this sourness.

RESEEDING.

When Grown in Rotation with Corn.—Bur clover will mature enough seed by about the 20th of May to thoroughly reseed the field for another year. As soon as sufficient seed have matured for reseeding and the season will permit, the land on which the clover is growing should be broken thoroughly with a two-horse plow and then run over with a cutaway harrow. The corn rows should be run from four to five feet apart and a fertilizer application of a mixture of 200 pounds of acid phosphate and 100 pounds of kainit applied in the drill when the corn is planted. By this method it will be possible to get the corn in the ground early in June, which has been found the best time on the fine sandy loam soil of the Edgecombe Test Farm, especially when fertilizers are to be used. The corn should be reduced to a stand of 18 or 20 inches on medium land. As it will require few cultivations, the entire cost of the corn crop for fertilizer and labor, up to time of harvesting, should not exceed $4.50 per acre, and a crop of from 20 to 60 bushels of shelled corn per acre should be expected on fairly good land with an average good season. Fig. 11 shows corn which was treated in this way.

Excellent results have also been obtained by running off the corn rows in the bur clover field during March, April or early May, and applying the fertilizer in this furrow. Then two furrows are thrown on the fertilizer with turning plow and after allowing to stand awhile the corn is planted in the usual way. This will leave between the corn rows a middle some two feet wide of growing clover. Now, without disturbing this middle, the corn is cultivated one or more times with a suitable plow or cultivator before the seed of the bur clover have matured. As soon as the seed are ripe the middle is broken out by means of a one-horse turning plow, followed shortly by cultivation with a Planet Jr. cultivator, which should level down and pulverize pretty thoroughly the land between the rows. This will ordinarily conclude



the cultivation for corn. Bur clover when treated as indicated above will mature enough seed to be assured of a good stand the following fall and spring.

If it is desired to sow cowpeas in the corn at the last plowing, they will not in the least injure the prospects for a stand of bur clover late in the fall. This rotation of corn and bur clover can be kept up indefinitely with increasing yields of both corn and clover and cowpeas if they are sown in the corn.

When Grown in Rotation with Cotton.—That bur clover is a good preparation for cotton was strikingly demonstrated in our experimental work at the Edgecombe Test Farm last year. Cotton grown on bur clover sod and receiving an application of a mixture of 200 pounds of acid phosphate and 100 pounds of kainit gave as large a yield of seed cotton per acre as cotton grown on the same type of soil and fertilized with 1,000 pounds of a mixture analyzing 7 per cent available phosphoric acid, 2½ per cent potash and 2½ per cent nitrogen.

Bur clover in rotation with cotton should be sown in the cotton at or just before the last cultivation or cultivated in lightly before the first of September. During the fall the clover will come up and grow all winter and spring. From ten days to two weeks before planting time, the rows should be run deep in the middles between the old cotton rows and an application of 200 pounds of acid phosphate and 100 pounds of kainit should be made per acre. Throw two furrows on this and leave until ready to plant cotton, which should be done in the usual way, having a harrow to precede the planter. This will leave an unbroken sod of bur clover of some 18 to 24 inches wide, which should be allowed to remain until seed enough have matured to give a good seeding for growth the following fall. When the cotton is well up, run over the land with a harrow to thoroughly break up the crust that has formed, being careful not to injure the little cotton plants. Follow this cultivation in a few days with a slight "siding" of two furrows per row with a Planet Jr. cultivator or cotton plow. The cotton will not need further cultivation until it has been chopped, after which it should be "sided" with a Planet Jr. cultivator. If the clover has grown rank enough to interfere with the growth of the cotton, run close to both sides of the unbroken middles with a small turning plow and partially cover up the clover by turning the furrows on the clover. As soon as the cotton will bear it and the seed are sufficiently matured the middles should be thrown out to the cotton. After standing a few days a Planet Jr. cultivator should be run between the rows to level the middles. From this point on the cultivation given the cotton should be shallow and frequent. In this way it will be possible to grow cotton with increasing productivity without the addition of any nitrogen in the fertilizer, and bur clover without having to sow any seed after the first year. Bur clover after cotton is shown in Figs. 12 and 13. The left half of Fig. 12 shows the clover with the dead cotton stalks removed, while the right half shows the bur clover growing in a portion of the same field with the cotton stalks still standing.

BUR CLOVER AS A COVER CROP AND SOIL PROTECTOR.

From what has preceded it will be readily seen that bur clover has special advantages as a cover crop for orchards and other places where protection is needed in fall and winter and early spring. It is during these parts of the year that our lands are most exposed to washing from the surface and the

FIG. 12.—BUR CLOVER AFTER COTTON; CLOVER 15 INCHES HIGH, APRIL 15, 1903.

loss of plant-food from leaching. The clover will prevent this to a large extent, at least, by appropriating the plant-food as it becomes available and then after the clover dies down in the spring will leave the plant-food it took from the soil and collected from the air in the land for the use of succeeding crops. After it has matured seed, other crops may follow; orchards may be cultivated and later planted in peas, in case it is desired. This procedure will enrich the land very rapidly and at small cost. Liberal applications of acid phosphate and potash salts should be used in connection with soil improvement with bur clover and cowpeas. It is not intended to suggest that bur clover will take the place of cowpeas, but rather to supplement the work of the latter, the growing season of which begins about the time the clover has finished its mission. They fit into each other therefore nicely, and can be grown to the greatest advantage in connection with general and many kinds of special farming in this State.

BUR CLOVER BACTERIA INOCULATE ALFALFA.

Great interest has been aroused throughout this State in the growing of alfalfa. There are at present several small fields of good alfalfa in the State and a great number of people are making efforts to grow it. One of the main difficulties in getting a start of this crop is the absence, in nearly all our soils, of the bacteria which enable the alfalfa to get its nitrogen from the air. Without the presence of these, except on extremely rich land, it is not possible to grow alfalfa successfully. Last summer Dr. C. G. Hopkins of the Illinois Experiment Station announced that he had found that the bacteria of sweet clover—*Melilotus alba*—would inoculate alfalfa, these two plants being close akin. We made a similar observation this spring and, in addition, found that the bacteria on bur clover are the same as those on alfalfa, or, at any rate, the bur clover bacteria grow on the roots of alfalfa. In illustration (Fig. 2), page 656, showing nodules on the roots of bur clover, will be seen an alfalfa root growing through a bur clover bur, and which has developed on it nodules directly on the edges of the bur. The alfalfa from which this plant was obtained was sown last fall where bur clover had grown the previous winter and spring. Practically all the plants showed the inoculation, while alfalfa grown on the same type of soil in the same field which had not had bur clover on it was not inoculated. A large number of alfalfa plants dug up were found to have their roots passing through burs of the clover. In the clover itself it is almost always found that inoculation starts on the roots within the bur. The inoculation of alfalfa by the bur clover bacteria has an important bearing on the growth of alfalfa, as the bur clover carries its own inoculation, and alfalfa may follow this crop with the certainty of good inoculation from the start. Another way to get the inoculation would be to grow a small area of bur clover and use the soil from this for inoculating the alfalfa. A thin seeding of bur clover with the alfalfa would likely accomplish the same result and without the loss of time.

FIG. 13.—BUR CLOVER AFTER COTTON ON SANDY LAND, EDGECOMBE TEST FARM, MAY 12, 1903.

STATE INDUSTRIES.

In accordance with the long-established habit of the Department of Agriculture and Statistics, the August BULLETIN presents a list of the Cotton, Woolen and Silk Mills of the State; of Miscellaneous Establishments, by counties, including Fertilizer Factories and Oil Mills, Furniture, Sash, Door and Blind, Brooms, Cotton Gins, Saw and Lumber Mills, Roller Flour Mills, Canneries, Chairs, Plows, Brick and Tile, Baskets and Crates, Ice, Wagons and Buggies, Dairies, Coffins, Overalls and Pants, Bags, Shuttles, Terra-cotta Pipes, Machine Shop and Foundry, Mattress, Harness and various others; and a registry of improved Cattle, Hogs, Horses, Sheep and Poultry. It has been difficult to obtain a complete list. Doubtless this one as presented is not perfect. Year by year the Department has sought to make the list more and more complete, but for some unaccountable reason some owners and managers of the manufacturing plants are averse to, or very slow in, giving the information asked for. They fail to recognize that THE BULLETIN, going to many thousands of readers in the State and sought for by many inquirers from without the State, is offering free an excellent medium of advertising their business.

The sheriffs and registers of the counties, the regular correspondents of the Department, and others to whom letters of inquiry have been addressed have been very kind and prompt in giving desired and valuable information. THE BULLETIN makes its acknowledgment of their kindness and returns its sincere thanks.

The publication of the statistics within advertises the onward and upward progress of North Carolina, and is useful and convenient in many ways. THE BULLETIN will be grateful for the correction of any errors that may have occurred, in order that correction may be made in the next annual publication of the lists.

LIST OF COTTON MILLS

REPORTED TO THE DEPARTMENT OF AGRICULTURE, YEAR 1904.

Name of Mill.	Post-office.	No. Spindles.	No. Looms.	Annual Capacity—Pounds or Yards.
Alamance County—				
Daisy Hosiery Mills	Burlington			75,000 dozen hose.
E. M Holt Plaid Mills	do			9,000 pounds per week.
Altamahaw Mills	Elon College			Cotton fabrics.
Elmira Cotton Mills Co.	Burlington			Cotton goods, 20,000 pounds weekly.
The Lakeside Mills	do	32,000	147	50,000 yards annually.
Holt Granite Mfg. Co.	Haw River			2,300,000 pounds.
Travora Mfg. Co.	Graham			Cotton yarns.
Voorhees Mfg. Co.	do			2,150 bales, 20 pieces each
Virginia Cotton Mills	Swepsonville			501,531 pounds annually.
Burlington Hosiery Mills	Burlington			900 dozen hose per week.
Sidney Cotton Mills	Graham			2,750,000 yards.
Aurora Mills	Burlington			
Windsor Cotton Mill	do			
Glenco Mills	do	4,100	225	
Juanita Mills	do	6,200		1,000,000 pounds.
Oneida Mills	Graham	11,248	603	225,000 pounds.
Carolina Mills	do	5,360	71	
Belmont Mills	do	2,512	199	650,000 pounds.
Voorhees Mfg. Co.	do		136	520,000 pounds.
Ossipee Mills	do	4,000	342	1,200,000 pounds.
Saxapahaw Mills	Saxapahaw	5,000	100	850,000 pounds.
Alexander County—				
Moore Cotton Mills	Liledoun	2,000	96	1,500,000 yards.
Alspaugh Cotton Mill	Taylorsville			175,000 yards.
Little River Mills	do	820	24	260,000 yards.
Anson County—				
Wadesboro Cotton Mills	Wadesboro	6,707		780,000 pounds.
Hargrave & Leak Mfg. Co.	do	60 machines		
Beaufort County—				
Washington Knitting Mills	Washington			
Buncombe County—				
Asheville Mills	Asheville			
Wm. Whittam Textile Co.	do		150	800,000 yards.
Burke County—				
Waldensian Hosiery Mill	Valdese	35 knitting mach.		Output 45,000 doz. hose.
Alpine Cotton Mills	Morganton	10,224		2,500,000 pounds.
Henry River Mfg. Co.	Hildebran			2,500,000 pounds.
Cabarrus County—				
Cannon Mfg. Co.	Concord	23,000	900	16,000,000 yards.
Cabarrus Mills	do	8,500	500	8,000,000 yards.
Odell Mfg. Co.	do	42,000	1,750	24,000,000 yards.
Lippard Yarn Mills	do			
Bala Cotton Mill	do	3,040		300,000 pounds.
Coleman Mill	do	5,200	140	
Gibson Mfg. Co.	do	16,640	519	2,000,000 pounds.
Patterson Mfg. Co.	do	3,000		
Bleachery Mills	do			
Kindley Mills	Mt. Pleasant	3,712		520,000 pounds.
Tuscarora Mills	do	2,880		500,000 pounds.
Caldwell County—				
Gwyn-Harper Mfg. Co.	Patterson	1,800	40	Output 240,000 pounds.
Hudson Cotton Mfg. Co.	Lenoir	4,000		
Granite Mfg. Co.	Granite Falls	3,000		Output 600,000 pounds.
Rhodhiss Mfg. Co.	Rhodhiss	15,000	460	Output 3,000,000 pounds.
Lenoir Mills	Lenoir	3,300		208,000 pounds.
Catawba County—				
Maiden Cotton Mills	Maiden	2,230		
E. L. Shuford Mfg. Co.	Brookford	17,000	400	1,500,000 pounds.
The Newton Cotton Mills	Newton	8,000		2,000,000 pounds.
Long Island Cotton Mills	Long Island	3,000		600,000 pounds.
Providence Cotton Mills	Maiden	6,128		800,000 pounds.
Union Cotton Mills	do	11,380		1,000,000 pounds.
Catawba Cotton Mills	Newton	3,000		400,000 pounds.
Monbo Cotton Mills	Monbo	3,664		600,000 pounds.
Newton Hosiery Mills	Newton			
Chatham County—				
J. M. Odell Mfg. Co.	Pittsboro	6,700		600,000.
Hadley-People Mfg. Co.	Siler City	2,500		800,000 pounds.
Siler City Mills	do			
Chowan County—				
Edenton Cotton Mill	Edenton	8,512		800,000 pounds.

COTTON MILLS—Continued.

Name of Mill.	Post-office.	No. Spindles.	No. Looms.	Annual Capacity—Pounds or Yards.
Cleveland County—				
Bonnie Cotton Mills	Kings Mountain	9,360		1,040,000.
Buffalo Mfg. Co.	Stubbs	3,100		313,000 pounds.
Belmont Cotton Mills	Shelby	4,000		50,000.
Cleveland Mill and Power Co.	Lawndale	5,576		1,775,000 pounds twine.
Double Shoals Cotton Mills	Double Shoals	3,200		3,000 daily.
Enterprise Mills	Kings Mountain	5,364	170	7,140,000 yards.
Cleveland Mill and Power Co.	Cleveland Mills	1,000		1,400,000 pounds.
Laurel Glen Mills	Shelby			
Shelby Cotton Mills	do	7,488	250	
Burton Mill	do			
Shelby Knitting Mills	do			
Craven County—				
Southern Hosiery Mills Co.	New Bern			
Cumberland County—				
Holt-Williamson Mfg. Co.	Fayetteville	10,192	434	1,000,000 pounds.
Holt-Morgan Mills	do	10,000	434	3,906,000 yards.
Tolar, Hart & Holt Mills	do	10,944		1,300,000 pounds.
Fayetteville Mills	do			
Hope Mills Mfg. Co.	Hope Mills	12,480	1,005	8,000,000 yards.
Cumberland Mills	Cumberland	2,736		800,000 pounds.
Davidson County—				
Nokomis Cotton Mills	Lexington	12,480	320	4,492,800 yards.
Wennonah Cotton Mills	do	11,856	417	2,000,000 pounds.
Davie County—				
Cooleemee Cotton Mills	Cooleemee	39,168	1,296	20,000,000 yards.
Durham County—				
Durham Mfg. Co.	Durham	23,500	800	12,000,000 yards.
Pearl Mills	do	10,336	238	1,000,000 pounds.
Commonwealth Mfg. Co.	do	7,000		1,250,000 pounds.
Golden Belt Mfg. Co.	do	24,416	640	1,629,425 pounds.
Durham Hosiery Mills	do			
The Erwin Cotton Mill Co.	West Durham	25,088	926	5,150,000 pounds.
Willard Mfg. Co.	Willardsville			
Edgecombe County—				
Fountain Cotton Mills	Tarboro	5,304		950,000 cotton yarn hosiery.
Tarboro Cotton Factory	do	13,200	200	3,500 bales cotton.
Runnymede Hosiery Mills	do			
Forsyth County—				
F. & H. Fries Mills	Winston-Salem	864	50	150,000 output.
Maline Mills	do	Knitting Mill.		
South Side Mill	do	10,752	168	1,500,000 pounds.
Arista Mills	do	5,184	200	1,000,000 pounds.
Shamrock Mills	do			300,000 pounds.
P. H. Hanes Knitting Co.	do			60,000 dozen underwear.
Victor Hosiery Mills	Kernersville	28 knitters, 5 ribbers and 4 sewing machines.		
Twin City Knitting Mills	Winston-Salem			
Winston Knitting Mills	do			
Davis-Crews Knitting Mills	Kernersville			
The Greenfield Hosiery Mill	do			
Lowry Hosiery Mills	do			
American Hosiery Mills	do	24 machines		60,000 dozen.
Franklin County—				
Sterling Cotton Mills	Franklinton	6,448		2,000,000 pounds.
Laurel Cotton Mills	Laurel			
Gaston County—				
Ozark Mills	Gaston	10,300		1,100,000 yards.
Stanley Creek Cotton Mills	Stanley	4,160		1,000,000 pounds.
Vivian Cotton Mills	Cherryville	1,632		840,000 pounds.
Modena Mills	Gastonia	9,000	208	1,333,000 pounds.
Dilling Cotton Mills	Kings Mountain	11,136	552	1,250,000 pounds.
Kings Mountain Mfg. Co.	do	4,992	130	570,000 pounds.
Trenton Cotton Mills	Gastonia	8,448		700,000 pounds.
Gastonia Cotton Mfg. Co.	do	10,000	300	780,000 pounds.
The Avon Mills	do	10,000	300	780,000 pounds.
Morowebb Cotton Mills Co.	Dallas	5,376		600,000 pounds.
The Chronicle Mills	Belmont	5,000		1,400,000 pounds.
Dallas Cotton Mills	Dallas	4,240	160	1,000,000 pounds.
Loray Mills	Gastonia	25,000	820	4,500,000 pounds.
Cora Cotton Mills	Kings Mountain	10,560		
High Shoals Cotton Mills	High Shoals	8,944	414	2,000,000 pounds.
Tuckaseegee Mfg. Co.	Mount Holly	4,996		1,200,000 pounds.
Gaston Mfg. Co.	Cherryville	6,656	192	750,000 pounds.
Cherryville Mfg. Co.	do	5,824		696,000 pounds.

COTTON MILLS—CONTINUED.

Name of Mill.	Post-office.	No. Spindles.	No. Looms.	Annual Capacity—Pounds or Yards.
Gaston County—continued.				
Albion Cotton Mill	Mount Holly	2,500		
Mt. Holly Cotton Mill	do	2,000		
Stanley Cotton Mill	do	5,000		
Crowder Mountain Cotton Mill	Philipsburg	4,000	121	500,000 pounds.
Southern Cotton Mills	Bessemer City	16,000	401	2,400,000 pounds.
Mims Mfg. Co.	Mount Holly	4,000		850,000.
Spencer Mountain Mills	Lowell	4,500		1,000,000 pounds.
McAden Mills	McAdensville			
Arrington Cotton Mills	Gastonia	7,300		
Bessemer City Cotton Mills	Bessemer City			
Mountain Island Mills	Mountain Island	6,250	104	125,000 pounds.
Catawba Electric Power Co.	do			
Lulu Cotton Mills	Kings Mountain			
Harden Mills	Worth	2,080		300,000 pounds.
Granville County—				
Oxford Cotton Mills	Oxford	6,120		1,500,000 pounds.
Guilford County—				
Proximity Mfg. Co.	Greensboro	20,200		7,000,000 pounds.
White Oak Mills	do			New mill.
Oakdale Cotton Mill	Jamestown	5,400		1,350,000 pounds.
Hiawatha Mfg. Co.	Burlington	3,744		570,000 pounds.
Minneola Mills	Gibsonville	2,000	200	
Revolution Mills	Revolution	14,500	376	1,100,000 pounds.
Clarence A. Cone	Greensboro		144	360,000 pounds.
Mt. Pleasant Mfg. Co.	Kimesville	2,000	101	2,000,000 yards.
Halifax County—				
Weldon Cotton Mfg. Co.	Weldon	20 knitting mach.		300,000.
Rosemary Mfg. Co.	Roanoke Rapids	10,500	258	1,200,000.
Scotland Neck Cotton Mills	Scotland Neck			250 dozen.
Enfield Knitting Mills	Enfield			120,000 dozen hose.
Roanoke Mills Co.	Roanoke Rapids	15,904	600	2,000,000 pounds.
United Industrial Co.	do			
Crescent Hosiery Co.	Scotland Neck	75 knitting mach.		
E. Shields	do			
Littleton Hosiery Mills	Littleton	62 machines		50,000 dozen.
Henderson County—				
Hart Mfg. Co.	Flat Rock			
Hendersonville Knitting Mills	Hendersonville			62,600 dozen hose.
Hertford County				
Winton Knitting Mills	Winton			
Iredell County—				
Statesville Cotton Mills	Statesville	10,000	180	
Bloomingfield Cotton Mill	do			
Mooresville Cotton Mills	Mooresville	8,740	257	1,500,000 pounds.
Turnersburg Mills	Turnersburg	1,600		360,000 pounds.
Johnston County—				
Clayton Cotton Mills	Clayton	5,129		700,000 pounds.
Selma Cotton Mills	Selma	5,000		New mill.
Holt Cotton Co.	Smithfield			500,000 pounds.
Smithfield Cotton Mill	do	10,000		1,040,000 pounds.
Lenoir County—				
Orion Knitting Mill	Kinston			
Kinston Cotton Mill	do	12,000		1,800,000 pounds.
Lincoln County—				
Mariposa Cotton Mills	Mariposa	3,280 spin spdls. 1,360 twister "		500,000 pounds.
Laboratory Cotton Mills	Lincolnton	5,025		5,080,000 yards.
John Rudisill Mfg. Co.	do	1,248		312,000 pounds.
Lincoln Cotton Mills	Southside	7,000		600,000 pounds.
Long Shoals Cotton Mills	Long Shoals	9,240		88,400 pounds.
Indian Creek Mfg. Co.	Lincolnton	2,704		31,200 pounds.
Elm Grove Cotton Mill	do	3,700		1,000,000 pounds.
Daniel Mfg. Co.	do	8,000		500,000 pounds.
Indian Creek Knitting Mills	Dora			
Montgomery County—				
Smitherman Cotton Mill	Troy	3,328	216	600,000 pounds.
Capelsie Cotton Mill	do	2,500		
Eldorado Cotton Mills	Ansonville	4,000		400,000 pounds.
National Mfg. Co.	Milledgeville			
Yadkin Falls Mfg. Co.	do			
Mecklenburg County—				
Linden Mfg. Co.	Davidson	5,824		450,000 pounds.
Cornelius Cotton Mill	Cornelius	5,000	200	
The Elizabeth Mills	Charlotte	6,000		350,000 pounds.
Louise Mills	do	25,000	552	

COTTON MILLS—CONTINUED.

Name of Mill.	Post-office.	No. Spindles.	No. Looms.	Annual Capacity—Pounds or Yards.
Mecklenburg County—continued.				
Charlotte Cordage Co.	Charlotte	2,020	110 bdrs	572,000 pounds.
Charlotte Cotton Mill	do	10,000	250	1,000,000 pounds.
Atherton Mills	do	10,000		650,000 pounds.
Fidelity Mfg. Co.	do	10,000		750,000 pounds.
Highland Park Mfg. Co.	do	7,000	460	1,050,000 pounds.
Chadwick Mfg. Co.	do	12,800	300	
Ada Mfg. Co.	do	8,000		2,200 bales.
Magnolia Mills	do	4,100		200,000 pounds.
Alpha Mills	do			
The Victor Cotton Mills	do	12,672 spin. spdls. 6,188 twister "		1,080,000 pounds.
Magnolia Mills	do	4,096		200,000 pounds.
Crowley Mfg. Co.	do			
The O. A. Robins Co.	do			
Orient Mfg. Co.	do			
Barnhardt Mfg. Co.	do			1,500,000 pounds.
Dover Mills	Pineville			
Anchor Mills	Huntersville			
Moore County—				
Sanford Cotton Mills	Sanford	9,028	580	1,900,000 pounds.
High Falls Mfg. Co.	High Falls	2,912		450,000 pounds.
Cameron Cotton Mill Co.	Cameron	1,800		350,000 pounds.
Eugenia Mfg. Co.	Jonesboro	3,136		500,000 pounds.
Nash County—				
Rocky Mount Mills	Rocky Mount	26,000		2,500,000 pounds.
New Hanover County—				
Delgado Mills	Wilmington	10,304	424	75,000 pounds.
The Wilmington Cotton Mills	do	6,824	432	1,250,000.
Orange County—				
Eno Cotton Mills	Hillsboro	10,000		1,200,000 pounds.
Alberta Mills	Chapel Hill	6,000		
Blanch Hosiery Mills Co.	do	42 machines		60,000 dozen.
Pasquotank County—				
Elizabeth City Mills	Elizabeth City	1,000		80,000 pounds.
Elizabeth City Hosiery Co.	do			
Person County—				
Roxboro Cotton Mill	Roxboro	8,300		2,000,000 pounds.
Pitt County—				
Greenville Knitting Mill	Greenville	14 knitters	22 sew'g machines	112,000 pounds.
Polk County—				
Tryon Hosiery Co.	Lynn		110	Don't spin.
Randolph County—				
Worth Mfg. Co.	Worthville	9,200	456	1,040,000 pounds.
Cedar Falls Mfg. Co.	Cedar Falls	3,936	136	626,000 pounds.
Randolph Mfg. Co.	Franklinville	3,936	129	672,000 pounds.
Carolina Mfg. Co.	Ramseur	11,072	340	5,000,000 yards.
Enterprise Mfg. Co.	Coleridge	3,750		560,000 pounds.
Franklinville Mfg. Co.	Franklinville	3,472	90	1,000,000 pounds.
Randleman Mfg. Co.	Randleman	10,000	718	
Naomi Falls Mfg. Co.	do	6,000	300	
Plaidville Mfg. Co.	do			
Marie Antoinette Mills	do			
Randleman Hosiery Mills	do			
Pearl Hosiery Co.	do	9 knitting mach.		52,000 pounds.
Columbia Mfg. Co.	Ramseur	11,072	340	4,500,000 yards.
Richmond County—				
Great Falls Mfg. Co.	Rockingham	7,440	236	1,062,000 pounds.
Roberdell Mfg. Co. No. 2	do	7,904	300	2,000,000 pounds.
Roberdell Mfg. Co. No. 1	do	6,032	304	3,771,947 pounds.
Pee Dee Mfg. Co.	do	15,426	704	2,700,000 pounds.
Midway Mills	do	8,000	200	1,200,000 pounds.
Steele's Mills	do	23,290	600	9,612,547 yards.
Ledbetter Mfg. Co.	do	2,512		500,000 pounds.
Textile Mfg. Co.	do			
Robeson County—				
Lumberton Cotton Mills	Lumberton	11,774		2,500,000 pounds.
Maxton Cotton Mills	Maxton			
Rockingham County—				
Spray Cotton Mills	Spray	25,000		3,000,000 pounds.
Lily Mills	do	2,496	324	1,400,000 pounds.
Nantucket Mills	do	6,864	806	2,600,000 pounds.
Edna Cotton Mills	Reidsville	25,300	550	1,500,000 pounds.
The Mayo Mills	Mayodan	31,816		4,000,000 pounds.
The Avalon Mills	do	13,128		1,976,000 pounds.

COTTON MILLS—CONTINUED.

Name of Mill.	Post-office.	No. Spindles.	No. Looms.	Annual Capacity—Pounds or Yards.
Rockingham County—continued.				
Rhode Island Co.	Spray	5,376		390,000 pounds.
Morehead Cotton Mill	do	7,392		
Leaksville Cotton Mill	do	3,584	624	
Steel Mills	Rockingham	2,329	600	1,191,415 pounds.
Rowan County—				
Vance Cotton Mills	Salisbury	10,000		900,000 pounds.
Salisbury Cotton Mills	do	20,000	589	4,000 bales.
Patterson Mfg. Co.	China Grove	9,296	158	1,771,378 pounds.
Lynn Mills Co.	Landis	3,500		1,000,000 pounds.
Salisbury Hosiery Co.	Salisbury	42 knitters		60,000 dozen.
Kesler Mfg. Co.	do	20,800	248	225,000 pounds.
Rowan Knitting Mills	do			
Littman Mill and Braid'g Wks.	do			
Rutherford County—				
The Florence Mills	Forest City	15,000	400	Consumes 7,400 bales cotton.
The Henrietta Mills	Henrietta	75,000	1,876	Consumes 26,000 bales.
The Henrietta Mills	Caroleen			
Levi Cotton Mills Co.	Rutherfordton	6,240		Consumes 480,000 lbs.
Cliffside Mills	Cliffside	10,800	610	
Scotland County—				
Scotland Cotton Mill	Laurinburg	10,000		1,700,000 pounds.
Dickson Cotton Mill	do	6,500		2,080,000 yards.
Richmond Cotton Mills	Laurel Hill	2,500		375,000 pounds.
Ida Mills	Elmore	4,400		750,000 pounds.
Springfield Cotton Mill	do	3,500		500,000 pounds.
Stanly County—				
Norwood Mfg. Co.	Norwood	8,128		625,000 pounds.
Wiscassett Mills	Albemarle	40,000		
Efirds Mfg. Co.	do	10,000		1,200,000 pounds.
Surry County—				
Hamburg Cotton Mills	Mt. Airy	1,600	20	
Laurel Bluff Cotton Mills	do	2,400		300,000 pounds.
Pine Hill Mills	do			
Hazelhurst Mills	Hazel			
Union County—				
Monroe Cotton Mills	Monroe	8,320		600,000 pounds.
Rodman Heath Cotton Mills	Waxhaw	5,420		
Vance County—				
Harriet Cotton Mills	Henderson	15,800		
Balfrow Knitting Co.	do	110 machines		75,000 dozen.
Henderson Mills	do			
Seaboard Knitting Mills	do			
Wake County—				
Pilot Mills	Raleigh	7,000	325	1,250,000 yards.
Raleigh Cotton Mills	do	15,700		1,750,000 pounds.
Caraleigh Mills	do	10,400	436	5,000,000 yards.
Melrose Knitting Mills	do			Underwear.
Neuse River Mills	do	8,000	256	2,400,000 yards.
Raleigh Hosiery Co.	do	90 knitting mach.		175,000 pounds.
Royall Cotton Mills	Wake Forest	7,280	186	
Warren County—				
Littleton Hosiery Mills	Littleton	59 machines		
Wayne County—				
Wayne Cotton Mills	Goldsboro			
Boyden Mfg. Co.	do			
Wilson County—				
Wilson Cotton Mills	Wilson	6,080		1,000,000 pounds.

LIST OF WOOLEN MILLS

REPORTED TO THE DEPARTMENT OF AGRICULTURE.

Name of Mill.	Post-office.	No. Spindles.	No. Looms.	Annual Capacity—Pounds or Yards.
Spray Woolen Mills Co.	Spray		50	
Elkin Woolen Mills	Elkin	10 mules	80	300,000 pounds.
Gwyn-Harper Mfg. Co.	Patterson	480	10	90,000 pounds.
Southern Woolen Mills Co.	Blackburn	240	1	5,000 pounds.
Alpine Woolen Mill	Hazel	384	14	300 pounds.
Leaksville Woolen Mills	Leaksville	1,500	40	3 sets cards.
Reems Creek Woolen Mills	Weaverville	210	4	
Salem Woolen Mills	Winston-Salem	648	50	268,722 yards.
J. N. Emmett	Fayetteville			
Waynesville Woolen Mills	Waynesville	260	6	8,000 yards.
Northbrook Mills	Hull's X Roads	180		
Willow Brook Mills	Lincolnton	240	4	
Southern Woolen Mills	Kernersville	288	9	30,000 pounds.
Catawba Woolen Mills	Plateau	200		12,150 pounds.
Van Deventer Carpet Co.	Greensboro		80	
Samuel Young	Mooresboro	2 sets	cards.	
Dixon Mfg. Co.	Snow Camp	756	15	15,000 pounds.
Morehead Mills	Spray			
Roebuck & Littlewood	Helta			

LIST OF SILK MILLS

REPORTED TO THE DEPARTMENT OF AGRICULTURE.

Name of Mill.	Post-office.	No. Spindles.	No. Looms.	Annual Capacity—Pounds or Yards.
Stehli & Co. Silk Mill	High Point	2,500		New mill.
Ashley & Bailey Co.	Fayetteville		125	
Wadesboro Silk Mills	Wadesboro	15,000		
Roberdel Mfg. Co.	Rockingham			3,842,728 yards sew. silk.
Rosemary Mfg. Co.	Roanoke Rapids	8,112	208	1,050,000 pounds.
Patterson Textile Co.	do		80	500,000 yards.

MISCELLANEOUS MILLS

REPORTED TO THE DEPARTMENT OF AGRICULTURE.

Name of Mill.	Post-office.	Annual Output.
Alamance County—		
Scott-Mebane Mfg. Co.	Graham	
White Furniture Co.	Mebane	$250,000.
John A. Trolinger Co.	Haw River	2,000,000 brick.
Melville Brick Co.	Mebane	20,000 per day, summer.
Mebane's Store	do	$2,500.
Juanita Grist-mill	Burlington	18,000 bushels.
Central Mfg. Co.	do	Not in operation.
Continental Chair Co.	Mebane	8,000 dozen chairs.
Taraxacum Co.	do	
W. A. Murray & Co.	do	Fertilizer.
Walker Bros. Lumber Co.	Graham	
Geo. W. Anthony	Burlington	3,000,000 feet lumber.
Geo. W. Anthony	do	Brooms and handles.
F. L. Williamson & Co.	do	Shirts.
Home Ice and Refrigerating Co.	do	1,080 tons semi-annually.
Burlington Coffin Co.	do	8,600 coffins.
Carolina Steel Bridge and Construction Co.	do	
Southern Handle Mfg. Co.	do	
Gerringer & Sullivan	Elon College	Mill plants.

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Alleghany County—		
Sparta Roller Mills	Sparta	
Elk Creek Roller Mills	Elk Creek	
R. L. Doughton	Laurel Springs	Pins.
Alexander County—		
Williams Bros.	Hiddenite	100,000 wagon felloes, furniture spokes, etc.
Alspaugh Roller Mills	Taylorsville	15,000 barrels flour, 3,000 bushels meal.
Taylorsville Milling Co.	do	15,650 barrels flour. 15,650 bushels corn,
H. T. Campbell & Son	do	1,500,000 brackets.
Feimster Bros.	do	Lumber.
W. P. Ingram & Co.	do	Doors, sash and blinds.
Watts & Webster	Parte	Flour.
Bowman, Rink & Ekard	Polycarp	
Campbell & Williams	Vashti	
Hiddenite Roller Mills	Hiddenite	30,000 bushels wheat.
Williams Bros. Hardwood Co.	do	400,000 feet oak furniture boards, 150,000 ft. white oak wagon felloes, 100,000 feet bolster tongues.
I. N. Sharpe & Son	Mt. Pisgah	Flour.
Anson County—		
Anson Oil and Ice Co.	Wadesboro	
H. D. Pinkston & Son	do	Vehicles.
D. L. Saylor & Son	do	Vehicles.
Brasington & Co.	do	750,000 brick.
Henry W. Little Lumber Co.	do	
Ingram Bros. Lumber Co.	do	
The Ginnery	do	
The Independent Cotton Oil Co.	do	Cotton-seed meal.
Morven Milling and Ginning Co.	Morven	
Pee Dee Hardware Mfg. Co.	McFarlan	
John E. Efird	Goodman	
Goodman Tannery	Polkton	$5,500.
S. K. Harris Saw-mill	do	
Ashe County—		
Jefferson Roller Mills	Jefferson	25 barrels per day.
Mercer & Lewis Mills	Solitude	900,000 feet.
S. M. Delamar Mills	Reelsboro	
Pin Factory	Jefferson	500,000 pins.
Creston Wagon Co.	Creston	
Central Roller Mills Co.	do	
Wm. Transon Pin Factory	Jefferson	1,500,000 locust pins.
R. C. Carr & Co. Pin Factory	do	
Neal & Foster Roller Mills	do	30 barrels.
Helta Roller Mills	Helta	
Pierce Wagon Factory	Tussy	
Beaufort County—		
Mutual Machine Co.	Washington	$25,000.
Pantego Gin Co.	Pantego	850 square bales cotton.
Eureka Lumber Co.	Washington	12,000,000 feet N. C. pine.
do	do	75,000 truck barrels.
do	do	25,000 baskets, crates, etc.
do	do	125,000 mine rollers.
Jonathan Havens Mills	do	1,000 bushels corn meal, 20 tons cotton-seed meal.
Pamlico Iron Works	do	$20,000.
Stalk Cutter Factory	do	$850.
D. C. Way Lumber Co.	Haslin	7,000,000 feet.
J. S. Marsh Gin	Bath	400 bales cotton ginned.
Surry Parker Machine Shop	Pinetown	$50,000.
W. H. Wilkinson's Mills	Leechville	3,000,000 feet.
Moss Planing Mills	Washington	300,000 feet dressed per day.
J. G. Winstead & Sons	Winsteadville	400 bales cotton ginned, 4,000 bushels meal, 250,000 feet sawed lumber.
Carolina Shingle Co.	Bonnerton	360,000 feet timber, 1,050,000 shingles.
Moore Lumber Co.	Washington	Shingles and staves.
E. M. Short Lumber Co.	Washington	8,000,000 feet lumber.
H. M. Cox Saw-mill	Blount's Creek	
W. M. Marvin Saw-mill	do	
Parson's Saw-mill	do	
Thos. Norman Shingle Mill	do	
M. M. Hill Gin and Saw-mill	Chocowinity	
J. A. H. Tankard Gin and Grist-mill	Yeatesville	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Beaufort County—continued.		
Wm. Schuette Planing Mill Co.	Belhaven	
Surry Parker Tar and Chemical Works	Pinetown	
J. G. Hodges Saw and Grist-mill	Minneola	
A. N. Waters Shingle Co.	do	
W. S. D. Eborn Mill and Gin	Bunyan	
Roanoke R. R. and Lumber Co.	Bath	
J. T. Nicholson Saw-mill	do	
J. B. Kellingsworth Gin and Mill Co.	Beckwith	
Benj. Chauncey Saw-mill	Surry	
B. H. Thompson Cotton-gin	Idalia	
Whitehurst Gin and Barrel Co.	Aurora	
Springer Lumber Co.	South Creek	4,000,000 feet rough lumber, 300,000 feet dressed lumber, gin 200 bales cotton.
Croatan Lumber Co.	do	
J. L. Roper Lumber Co.	Roper	
Pantego Ginning Co.	Pantego	600 bales.
J. W. Oden & Co. Gin and Saw-mill	Hunter's Bridge	
G. W. Elliott Gin and Saw-mill	do	
Whitley & Whaley Shingle Mill	Bonnerton	
L. D. Bonner Saw-mill	do	
Luter & Lamm Saw-mill	Edwards	
A. M. Edwards Grist-mill	do	
Rowland Morris Saw-mill	Prescott	
Freeman & Hodges Lumber Co.	Washington	
Kugler Lumber Co.	do	
Havens Oil Co.	do	
Globe Shirt Factory	do	
W. B. Walling Lumber Co.	do	
S. R. Fowle & Son Lumber Co.	do	
Crystal Ice Mfg. Co.	do	7,815 tons.
John Havens Grist-mill	do	
John R. Perry Saw-mill	do	
Wollard Bros. Gin and Saw-mill	do	
M. L. Hodges Saw-mill	do	
R. C. Cherry Saw-mill	do	
W. L. Hodges Cotton-gin	do	
W. B. Rodman Cotton-gin	do	125 bales.
Washington Ginning Co.	do	
R. E. Hodges Saw-mill	do	
Pamlico Mfg. Co.	do	31,300 dozen negligee shirts.
Wm. Bragaw & Co.	do	Fertilizers.
Bertie County—		
Geo. T. Parker Coach Shops	Kelford	
D. K. Cecil & Co.	Windsor	12,000 brick.
Windsor Cotton and Peanut Co.	do	Gin about 300 bales cotton.
C. T. Goodwin Saw-mill	Colerain	600,000 feet lumber.
Cashie & Chowan Railroad and Lumber Co.	Windsor	6,000,000 feet lumber.
E. S. Dale	do	Vehicles.
Windsor Spoke and Lumber Co.	Quitsna	
W. D. Haggard	Aulander	Vehicles and coffins.
Harrington & Co.	Lewiston	Vehicles and coffins.
Bladen County—		
Bridge Co.	Bladenboro	500 cars bridge material.
Clarkton Brick Co.	Clarkton	500,000 brick.
Clarkton Ginning Co.	do	Gin 1,225 bales cotton
John Caswell Saw-mill	Abbottsburg	
D. B. Edwards & Bro. Saw-mill	Bladenboro	
Bridgers Lumber Co.	do	
Freeman & Frink Lumber Co.	do	
D. B. McKee Lumber Co.	Clarkton	
N. A. Currie & Bro. Brick Co.	do	500,000 machine brick.
John O. West Lumber Co.	Dawson'sLand'g	
J. T. Martin Lumber Co.	White Oak	
Holmes & Co. Tool Factory	Council Station	
Brunswick County—		
W. W. Murrill's Saw-mill	Malmo	1,000,000 feet lumber.
R. W. McKethan	Supply	Lumber, meal, and cotton ginned.
G. T. & Peter Rourk	Shallotte	Lumber, meal, and cotton ginned.
Navassa Guano Co.	Wilmington	
Cape Fear Fisheries Co.	do	
Atlantic Fisheries Co.	do	
R. W. Gibson Shingle-mill	do	
G. F. Drew Saw-mill	Southport	
F. N. Robbins Saw-mill	do	
J. H. Sexton Saw and Grist-mill, Gin	Winnabow	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Brunswick County—continued.		
J. S. Henry Saw-mill	Winnabow	
V. Smith Saw and Grist-mill	Ash	
G. E. Brooks & Co. Saw and Grist-mill	Seaside	
G. F. Bowen Fish Factory	Shallotte	
Gardner-Lacy Lumber Co.	Excelsior	
Isham McKeithan Grist-mill	Regan	
W. H. Stone Saw and Grist-mill, Gin	Calabash	
W. W. Drew Saw-mill	El Paso	
Buncombe County—		
Carolina Ice and Coal Co.	Asheville	
R. P. Walker Mfg. Co.	do	62,600 dozen singletrees.
Asheville Supply and Foundry Co.	do	
Wm. M. Jones Sash and Blind Co.	do	
Asheville Milling Co.	do	15,000 lbs. flour, 150,000 bu. mea
Asheville Ice and Coal Co.	do	
Asheville Tannery	do	
Drummond Plow Co.	do	
M. B. Wilkinson Lumber Co.	do	
McEwen-Gibson Lumber Co.	do	
J. S. Coleman Lumber Co.	do	
W M. Cooper Lumber Co.	do	
Balfour Quarry Co.	do	
Asheville Lumber Co.	do	2,500,000 feet lumber.
Weaverville Roller Mills	Weaverville	
Peoples Mills	Candler	
Jupiter Milling Co.	Jupiter	
Valley Roller Mills	Hominy Creek	
Burke County—		
Bridgewater Milling Co.	Bridgewater	60 barrels daily.
Huffman Mfg. Co.	Drexel	75 carloads timber.
Coffey Wagon Co.	Morganton	85 wagons and 15 buggies.
J. A. Payne & Son	do	60 dozen axe handles per day.
Morganton Mfg. and Trading Co.	do	Sash, doors, blinds and general wood-work.
Elkin Canning Co.	Elkin	200,000 cans.
Huffman & Mull Mills	Drexel	20 barrels flour per day.
J. E. Coulter Mills	Connelly Springs	Lumber, shingles and laths.
Connelly Springs Mills	do	Flour and meal.
Linville Roller Mills	Bridgewater	3,000 barrels flour.
Bailey's Fork Roller Mills	Morganton	
J. N. Payne & Son Spoke and Handle Co.	do	313,000 dozen hickory handles.
W. G. Hogan Roller Mill	do	
W. A. Wortman Roller Mill	do	
Hunting Creek Roller Mill	do	
Piedmont Lumber Co.	do	
C. B. Kincaid & Co. Roller Mill	Bridgewater	
Huffman & Mull Flour and Corn Mill	Drexel	
J. W. Bailey Foundry and Machine Shops	Hildebran	
A. Y. Sigman Lumber Co.	do	1,400,000 feet.
J. D. Pitts Lumber Plant	Glen Alpine	15,650,000 feet.
Glen Alpine Roller Mill	do	5,200 bus. wheat, 10,000 bus. corn
Caldwell Roller Mill	Worry	
Caldwell County—		
J. M. Bernhardt Mills	Lenoir	11,000,000 feet.
Dudley Lumber Co.	Granite Falls	50 cars lumber and bld'g material
Warlick & Whisnant	do	1,000 sticks and 1,000 pounds ex celsior per day.
Collettsville Lumber Co.	Collettsville	2,500,000 feet.
Lenoir Lumber Co.	Lenoir	3,000,000 feet rough lumber.
Harper Furniture Co.	do	$55,000.
Lenoir Mills	do	$60,000.
Gilley Brook Cannery	Granite Falls	800 cans vegetables, etc.
The Alleghany Co.	Scranton	20,000,000 feet lumber.
Mountain View Cannery	Cora	20,000 No. 3 cans.
Gunpowder Roller Mills	Lenoir	
Builders' Supply Co.	do	Lumber.
Wilson Lumber and Milling Co.	do	
Penn-Cardan Lumber and Mfg. Co.	do	
Dudley Milling Co.	do	
Camden County—		
Edward Garrenton Barrel Co.	Riddle	
George Beveridge Shuck Factory	South Mills	
South Mills Canning Factory	do	
Geo. Beveridge Gin, Grist and Saw-mills	do	
J. W. Johnson Coffin Co.	do	
A. Sawyer Gin, Saw and Grist-mills	Belcross	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Camden County—continued.		
Belcross Undertaking Co.	Belcross	
Stevens Gin, Grist and Saw-mills	Camden	
Cowell Gin, Grist and Saw-mills	Shiloh	
Forksey Gin, Grist and Saw-mills	do	
Shiloh Undertaking Co.	do	
Moser & Brock Lumber Co	Riddle	2,000,000 shingles.
Carteret County—		
T. M. Thomas Gin and Grist-mill	Beaufort	375 bales, 1,500 bushels corn.
D. S. Sanders Mill Co.	do	
Bell-Westbrook-Journey Co.	do	Fish scrap.
Mason & Co. Fish Scrap and Oil Co.	do	
Dawson & Son's Fish Scrap and Oil Co.	do	
J. C Graham Saw-mill	do	
Carteret Ice, Transport and Storage Co.	Morehead City	4,000 tons.
Swindell & Son Milling Co.	do	Lumber.
C. S. Wallace Fish Mill Co.	do	
A. T. Willis Bro. Fish Mill Co.	Smyrna	
W. S. Bell, Jr., Saw-mill	Newport	
G. N. Ives & Son Cannery	do	
Stewart's Fish Factory	Wildwood	
Sanders & Bro.	Bogue	Lumber.
A. B. Riggan & Co. Cannery	Marshallburg	$20,000.
Pamlico Lumber Co.	Lukens	
R. Mason & Co. Fish Mill	Hooker's Island	
Beaufort Little Neck Clam Co.	Beaufort	Cannery.
Dey & Bro.	do	750 tons fish scrap, 600 barrels fish oil.
Enterprise Packing Co.	do	
Chadwick & Caffey Oil Co.	do	
Caswell County—		
King Bros. Tobacco Factory	Blackwells	100,000 pounds.
Milton Chair Factory	Milton	150 chairs per day.
Catawba County—		
Latta & Martin Pump Co.	Hickory	360 pumps.
Hatton & Bourbonnais	do	12,000,000.
Ivey Mill Co.	do	New mill.
Terrell Milling Co.	Terrell	5,000 bus. wheat, 7,000 bus. corn.
Hickory Furniture Co.	Hickory	$80,000.
Hickory Milling Co.	do	150 bbls. per day, 200 bus. meal.
Moore Milling Co.	do	40 bbls. per day, 100 bus. meal.
Piedmont Wagon Co.	do	6,000 farm wagons.
Newton Roller Mills	Newton	15,000 barrels flour and 2,000,000 pounds bran.
O. D. Murray & Co.	Claremont	30 barrels per day.
J. Hunsucker Factory	Conover	15,000 handles, 25,000 sticks.
Monitor Milling Co.	Claremont	6,000 barrels flour, 3,000 pounds bran and 3,000 bushels meal.
Radical Remedy Co.	Hickory	$25,000.
Martin Furniture Co.	do	$80,000.
Chatham County—		
Ore Hill Mfg. Co.	Ore Hill	$15,000.
Lockville Roller Mills	Lockville	3,000 bbls. flour, 1,500 bush. meal.
Mrs. Mary Barringer's Roller Mill	do	
H. Henderson Tannery	Hadley	1,000 sides upper leather.
J. M. McIver Roller Mill	Gulf	6,000 bbls. flour, 18,000 bus. meal.
Bon Lee Roller Mill	Causey	
J. H. Dunlap Roller Mill	do	
J. R. Parks Roller Mill	Siler City	
Wm. Harden Tannery	Harper's X R'ds	
Cherokee County—		
R. M. Fain Roller Mills	Murphy	12,520 bbls. flour, 23,475 bu. corn.
F. A. Gennett Marble Works	do	12 carloads.
A. S. Emerson Marble Quarry	do	
Torrence Bros. Shuttle Factory	do	
F. P. Cover & Son Tannery	Andrews	48,000 sides.
Kanawha Hardwood Co.	do	939 cars lumber.
Appalachia T. A. Co.	Appalachia	
Chowan County—		
Edenton Ice and Cold Storage Co.	Edenton	About 3,000 tons.
Branning Mfg. Co.	do	33,000,000 feet lumber.
M. G. Brown Lumber Co.	do	
Dowdy Grist-milling Co.	do	
Edenton Iron Foundry	do	
Powell Bros. Saw and Grist-mill	do	
W. E. Jordan Saw and Grist-mill	do	
Chowan Lumber Co.	do	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Chowan County—continued		
O. E. Ward Saw-mill	Tyner	
W. H. Lane Saw-mill	do	
J. P. Ashley Saw and Grist-mill	Clum	
Tynch Bros. Saw and Grist-mill	do	
Z. W. Evans Saw and Grist-mill	Cisco	
H. C. Nixon Saw and Grist-mill	do	
Clay County—		
J. P. & R. C. Cherry's Mill	Hayesville	32,000 bbls. flour, 2,800 bu. meal.
Penland & Brooks Flouring Mill	do	
Mrs. V. Bell Flouring Mill	Brasstown	
J. T. Platt & Bro. Flouring Mill	do	
Thos. P. Murray Corundum Mill	Corundum	
Cleveland County—		
Shelby Foundry and Machine Works	Shelby	80,000 casting, 1,400 wrought iron.
J. W. Lineberger Son's Factory	do	25,000 per year.
Thompson Co.	do	Sash, doors, blinds, etc.
Cleveland Mfg. Co.	Cleveland	700,000 feet veneer.
Pearl Mills	Lawndale	1,500 bbls. flour, 2,000 bus. meal.
Verner Oil Co.	Lattimore	Cotton-seed meal.
Elliott & Lattimore	Ola	
M. P. Gantt & Co	Bellwood	Leather goods.
Fallston Roller Mills	Fallston	
H. G. Hall Cannery	Shelby	313,000 cans.
E. L. Calahan	do	Sash, doors and blinds.
B. B. Bobington Machine Shops	do	
B. Blanton Roller Mills	do	
J. H. McBrayer Roller Mills	do	
Hard & Co. Roller Mills	do	
Southern Cotton Oil Co.	do	Cotton-seed meal.
Columbus County—		
Oscar High Brick Mill	Whiteville	15,000 per day.
E. D. Williams' Mills	Cerro Gordo	New mill.
Williamson & Brown Land and Lumber Co.	do	New mill.
Council Tool Co.	Wananish	10,000 hooks, pullers and scrapers.
Butter's Lumber Co.	Boardman	1,600,000 feet lumber per month.
Chadbourn Mfg. Co.	Chadbourn	72,000 32-quart crates.
Acme Mfg. Co.	Cronly	Fertilizers.
American Consolidated Pine Fiber Co.	do	3,000,000 lbs. long-leaf pine straw.
Whiteville Lumber Co.	Whiteville	10,000,000 feet lumber.
H. B. Short Shingle Mill	Lake Wacca'aw	
D. W. Brown Lumber Mill	Cerro Gordo	
C. C. Pridgen	Tabor	
Woodward & Son	do	
Craven County—		
E. H. & J. A. Meadows	New Bern	Fertilizers.
J. H. Stewart	do	26,000 per day.
New Bern Cotton Oil and Fertilizer Mills	do	Cotton-seed products and fert.
New Bern Ice Co.	do	20 tons per day.
Goldsboro Lumber Co.	Dover	
The Pine Lumber Co.	New Bern	11,500,000 feet lumber.
Munger & Bennett	do	10,000,000 feet.
Broaddus & Ives	do	3,600,000 shingles, 6,000,000 feet lumber.
Carolina Canning Co.	do	
Elm City Lumber Co.	do	25,000,000 feet.
Blade's Lumber Co.	do	
J. S. Basnight Lumber Co.	do	
Brick and Tile Mfg. Co.	do	2,000,000 brick.
Cumberland County—		
Ward's Plow Works	Fayetteville	140 plows, 50 tons castings.
Cumberland Mfg. Co.	do	
Merchant Mills	do	
Fayetteville Woodenware Co.	do	22,500 doz. pails, 3,000 doz. tubs.
Southern Cotton Oil Mill Co.	do	
Fayetteville Ice Mfg. Co.	do	6,260 tons.
McMillan Bros.	do	
E. A. Poe Brick Co.	do	
Southern Pine Product Co.	do	
Weed Distillery and Mfg. Co.	do	
Currituck County—		
Owen's Saw-mills	Knott's Island	1,500,000 feet timber.
C. R. Vandecarr Factory	Moyock	Mattresses and cotton ginning.
Carolina Land and Lumber Co.	do	
Tarault & Norton	do	Woodenware, barrels, baskets, etc.
Jos. Tarault Saw-mill	do	
W. A. Cox Saw-mill	do	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Currituck County—continued.		
N. C. Land and Lumber Co.	Moyock	
G. E. Stevenson Grist-mill	Shawboro	6,000 bushels meal.
T. M. Bell Saw-mill	do	
C. L. Perkins Saw and Grist-mill	Sligo	
P. N. Bray Saw-mill	do	
A. M. Wiley Saw-mill	Snowden	
Dare County—		
Alligator Lumber Co.	East Lake	
J. A. Evans	Manteo	Vehicles.
Wm. Hutton Lumber Co.	Buffalo City	
Davidson County—		
Standard Chair Co.	Thomasville	180,000 chairs.
Thompson Chair Co.	do	90,000 chairs.
Lee Mfg. Co.	do	$20,000.
Oneida Chair Co.	Lexington	216,000 chairs.
The Central Mfg. Co.	do	108,000 chairs.
Eagle Lumber Co.	do	General shop work.
Peerless Mattress Co.	do	$15,000.
Atlas Table Co.	do	$50,000.
Dixie Furniture Co.	do	$150,000.
Elk Furniture Co.	do	$150,000.
Linwood Mfg. Co.	Linwood	$45 per day.
Victor Brick Co.	Lexington	1,500,000.
R. Everhardt & Co.	Arnold	$40,000.
Queen Chair Co.	Thomasville	10 doz. box-seat dining chairs per day.
Lexington Upholstery Co.	Lexington	$18,000.
Cramer Furniture Co.	Thomasville	250,000 chairs and rockers.
Holly Grove Roller Mills	Lexington	Flour, meal and feed stuff.
American Furniture Co.	do	$60,000.
Farmers' Supply Co.	do	
Lexington Drug Co.	do	
Southern Brass Co.	do	
Old Fort Lumber Co.	do	4,000,000 feet.
Cates Chair Co.	Thomasville	109,550 chairs.
Thomasville Mfg. Co.	do	
Thomasville Veneer and Panel Co.	do	3,000,000 feet.
Davie County—		
Mocksville Chair Co.	Mocksville	35,000.
Mocksville Furniture Co	do	$75,000.
Smithdeal, Call & Co.	Advance	25,000 pounds.
Cain & Son Mill	Mocksville	Lumber, meal, etc.
Purvey Mills	do	
Horn Bros. & Johnston	do	10,000 bbls. flour, 225,000 bu. meal.
Mocksville Roller Mills	do	1,200 bbls. flour, 9,000 bus. meal.
Seaford Bros. Saw-mill	do	
G. W. Green Saw-mill	do	
A. L. Betts Mantel Co.	do	
J. O. Freeman Hardwood Co.	do	1 car per week.
Hooper & Allen Roller-mill	do	
Barneycastle Bros. Saw-mill	do	
Farmington Roller Mills	Farmington	
A. W. Ellis Grist-mill	do	40,000 bushels.
W. H. Hobson Saw-mill	Jerusalem	
A. C. Wood Saw-mill	Advance	
Bailey & Bailey Saw and Grist-mill	do	
W. R. Kitchen Saw and Grist-mill	Kappa	
J. H. Harris Saw and Grist-mill	Fork Church	
H. S. Davis Saw and Grist-mill	do	
Myers & Son Saw-mill	do	
J. M. Summers Saw and Grist-mill	Dulins	
J. W. Etchison Saw and Grist-mill	Cana	
Booe & Lakey Saw-mill	Nestor	
Duplin County—		
Rose Hill Mfg. Co.	Rose Hill	100,000 crates.
Calypso Crate, Basket and Barrel Factory	Calypso	26,000 barrels, 24,000 crates, 40,000 baskets, 100,000 feet ash and poplar timber, and 200,000 pine.
D. H. Williams Lumber and Crate Factory	Safe	31,000 crates and 100,000 ft. lumber.
S. C. Carr Mills	Rose Hill	5,000 crates, 250,000 feet lumber and 2,000 bushels meal.
Warsaw Crate Co.	Warsaw	2,000,000 crates.
J. F. Croom & Bro. Crate Factory	Magnolia	45,000 crates.
Magnolia Mfg. Co.	do	135,000 berry crates, 7,000,000 quart baskets, and 1,000,000 feet lumber.

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Duplin County—continued.		
N. C. Cypress Co.	Magnolia	1,500,000 shing's, 800,000 ft. lumb
Wellington-Patten Crate Co.	Calypso	
Teacheys Crate Factory	Teacheys	
Teacheys Brick and Tile Co.	do	
Wallace Brick and Tile Co.	Wallace	
Murphy Crate Factory	Rose Hill	
Rowland Lumber Co.	Bowdens	
Durham County—		
Carolina Furniture Co.	Durham	$60,000.
Durham Roller Mill Co.	do	
Durham Fert. Co. (Branch Va.-C. C. Co.)	do	
American Tobacco Co.	do	
Blackwell's Tobacco Co.	do	
Durham Paper Box Factory	do	
Morris Son's Mfg. Co.	do	Tobacco.
Son La Woodworking Co.	do	
Durham Traction Co. Ice Plant	do	
J. S. Murray Mattress Factory	do	
Durham Telephone Mfg. Co.	do	
Automatic Packing and Labeling Co.	do	
Young & Stone	East Durham	Woodworking shops.
Denmark, Grisp & Co.	do	Woodworking shops.
Edgecombe County—		
Rocky Mount Ice and Fuel Co.	Rocky Mount	6,000 tons.
Consumers' Oil Mill	Tarboro	5,000 tons.
Rocky Mount Brick Co.	Rocky Mount	900,000 brick.
Hearne Bros. & Co.	Whitakers	8,000 coffins and caskets.
Tar River Mills	Tarboro	
Southern Cotton Oil Co.	do	Fertilizers.
Tarboro Machine Works	do	
Tar River Oil Co.	do	1,300 tons meal, 1,600 tons hulls 2,700 barrels oil, 200 bales linters
W. L. Stallings Flour and Meal Mill	do	
Riley Phillips Lumber Co.	Pinetop	
Harvey Webb Lumber Co	Macclesfield	
E. C. Wallace Lumber Co.	do	
Silas Lucas Brick Co.	Medora	
Edgecombe Brick and Tile Co.	do	2,500,000 brick.
Conetoe Mfg. Co.	Conetoe	
Southern Cotton Oil Co.	do	Cotton-seed meal.
Southern Ice Co.	Rocky Mount	
Forsyth County—		
Ogburn Hill & Co.	Winston-Salem	45,000 pounds tobacco per month
Kernersville Roller Mills	Kernersville	75 barrels per day.
Forsyth Iron Bed Co.	Winston-Salem	$50,000.
J. A. Vance & Co.	do	
Oakland Mfg. Co.	Winston	$12,500.
Kernersville Furniture Mfg. Co.	Kernersville	$40,000.
Taylor Bros.	Winston-Salem	742,000 manufactured.
Spach Bros. Wagon Factory	do	800 wagons, 20,000 tobacco boxes
Spach Bros. & Hoover Roller Mills	do	15 barrels flour, 25 bushels corn per day.
J. I. Nissen Wagon Works	do	2,400 wagons.
Fogle Bros. Factory	do	5,000 to 10,000 ft. worked per day
Crawford & Ragland	do	$25,000.
Geo. E. Nissen & Co.	do	4,000 farm and road wagons.
Liipfert, Scales & Co.	do	1,500,000 pounds.
S. B. Smith, Mfr. Artificial Limbs	do	150 legs.
N. D. Sullivan Tobacco Factory	Walkertown	Mfr. fine plug tobacco.
Winston Furniture Co.	Winston-Salem	$100,000.
Bower Roller Mills	Clemmons	1,600 lbs. flour, 1,800 lbs. feed and meal per day.
Winston Brick and Tile Co.	Winston-Salem	1,500,000 brick, 20,000 drain tile.
Wachovia Mills	do	30,767 bushels corn ground, 50,725 bushels wheat ground.
Walkertown Chair Co.	Walkertown	90,000 chairs.
Fogle Bros.	Winston-Salem	Lumber.
S. J. Nissen	do	Wagons and drays.
Salem Iron Works	do	
Southern Chemical Co. (Branch Va.-Car. Chemical Co.)	do	32,000 tons fertilizers.
Salem Parlor Furniture Co.	do	
Brown & Williamson Tobacco Co.	do	
R. J. Reynolds Tobacco Co.	do	
W. A. Whitaker Tobacco Co.	do	
Forsyth Roller Mills	do	15,000 barrels flour, 20,000 bus. meal, 700 tons feed.

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Forsyth County—continued.		
Winston Cigarette Machine Co	Winston-Salem	
Church Lumber Co.	do	
Winston Cockle Machine Co.	do	
Smith & Phillips Lumber Co.	do	
Martin Mfg. Co.	Walkertown	1,500 dozen suspenders.
Light Bros. Lumber Co.	do	
Oak Furniture Co.	do	
Knapp & Miller Lumber Co.	Rural Hall	
Harmon & Reed	Kernersville	
Woosley Bros.	Bower	500,800 lbs. flour, 469,500 lbs. feed and meal.
L. H. Sides	Clemmonsville	Flour.
I. A. Roberson	Belew Creek	Flour.
Franklin County—		
Louisburg Wagon Mfg. Co.	Louisburg	1,000 wagons.
Strickland's Dairy Farm	Katesville	$100 per month.
Louisburg Lumber Co.	Louisburg	2,000,000 feet lumber.
Tar River Stock Farm	Franklinton	$1,350 stock sold.
Laurel Dairy Farm	Laurel	4,000 pounds butter.
Allen Bros. & Ford Cotton-seed Oil Co.	Louisburg	
Louisburg Dairy Farm (C. C. Harris)	do	
Green & Yarboro	do	Fertilizers.
G. H. Kearney Gin, Saw and Grist-mill	Franklinton	
J. S. Williams Gin, Saw and Grist-mill	do	
J. H. Wilder Gin, Saw and Grist-mill	do	
S. C. Vann	do	Fertilizers.
Mapleville Mill Co.	Mapleville	
Gaston County—		
The Page Co.	Gastonia	$30,000.
Gastonia Oil Mills	do	2,000 tons seed.
Stanley Brick Co.	Stanley	30,000 brick per day.
Southern Cotton Oil Co.	Gastonia	Cotton-seed meal.
Grace Roller Mill	Mt. Holly	
Ormand Canning Co.	Bessemer City	
Gates County—		
Hathaway & Rountree	Hobbsville	500,000 feet lumber.
Cross & Co.'s Mill	Sunbury	Lumber.
L. L. Smith Flour and Lumber Co.	Gatesville	
L. H. Troutman Lumber Plant	do	
Geo. W. Rountree Lumber Plant	Willow	
Hollowell & Branch Lumber Plant	Selwin	
M. Benton Lumber Plant	Benton	
Story Bros. Lumber Plant	Eure	
Nathaniel Eure	do	Lumber.
E. A. Rountree & Co. Lumber Plant	Hobbsville	
P. L. Hobbs & Co. Lumber Plant	Trotville	
The Gates Lumber Co.	Hazleton	3,130,000 feet.
Willeyton Lumber Co.	Willeyton	
H. Powell & Co.	Adair	2,500,000 feet.
Graham County—		
Kanawha Hardwood Co.	Robbinsville	
Santeetlah Lumber Co.	do	
J. W. Eller	do	
Charles Liscubee & Son	do	
Slaughter Bros. Lumber Co.	do	
Thompson-Canby Lumber Co.	do	
Jas. A. Cook Lumber Co.	do	
Gilliland Locust Pin Co.	Dillsboro	
Landon White	Stecoah	
Slaughter & Cody	Cheoah	
Almond Lumber Co.	Almond	
W. W. Penrod & Son Lumber Co.	Sweet Gum	
W. D. Bradley	do	
Granville County—		
Taylor-Cannady Buggy Co.	Oxford	4,000 vehicles.
Oxford Roller Mills	do	25 bbls. flour and 200 bushels meal per day.
White Canning Co.	do	1,750 cans.
Oxford Furniture Co.	do	
W. A. Parham Roller Mills	do	
Parker & Hunt	do	Fertilizers.
J. W. Harris Mills	Wilton	
W. D. Kimball Roller Mills	Hargrove	
Day & Latta Roller Mills	Berea	2,028 bbls. flour, 5,172 bus. corn.
R. W. Massie & Co. Saw-mill	Bahama	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Greene County—		
R. D. S. Dixon & Sons	Snow Hill	Meal, cotton ginned and 150,000 ft. lumber.
Mewborn's Mills	do	4,000 bushels meal.
Patrick Farm Grist-mill	do	5,200 bushels meal.
Wiley Singleton	do	Lumber.
J. F. Harper	do	Lumber.
L. Hardy	do	Lumber.
J. F. Britt	do	Lumber.
R. G. Canady Saw-mill	do	Lumber.
Edwards & Warren Brick Machine Co.	do	
B. L. Dail Brick Machine Co.	do	
Ely Dargan Saw-mill	do	
Z. V. Barrow	Jason	Lumber.
Zeno Lyon	Ridge Springs	Lumber.
Elisha Dildy	Saratoga	Lumber.
W. M. Darden	Speight's Bridge	Lumber.
Exum & Dawson	Lindell	Lumber.
Elias Coward Saw-mill	Ayden	Lumber.
J. B. Goff Saw-mill	Shine	Lumber.
Guilford County—		
Tate Furniture Co.	High Point	Bed-room furniture.
The Continental Furniture Co.	do	$175,000.
High Point Buggy Co.	do	$45,000.
Lindsay Chair Co.	do	$80,000.
Tomlinson Chair Mfg. Co.	do	$150,000.
High Point Milling Co.	do	12,000 bbls. flour, 14,400 bu. meal.
Snow Lumber Co.	do	$35,000.
Rankin Coffin and Casket Co.	do	$30,000.
S. H. Mendenhall & Co.	do	8,000 pairs shoes, 8,000 lbs. harness leather.
Myrtle Desk Co.	do	5,000 office desks.
High Point Veneering Co.	do	1,600,000 feet veneer, 400 tons excelsior.
Kitchen Cabinet and Table Co.	do	6,000 kitchen tables, 1,500 kitchen cabinets, 300 long tables.
G. T. Glascock & Sons	Greensboro	500 tons castings.
E. E. Bain	do	Rough and dressed lumber.
Coulter & Lowry Co.	do	
Greensboro Ice and Coal Co.	do	18,000 tons ice.
Cape Fear Mfg. Co.	do	7,500,000 feet lumber.
Hardwood Mfg. Co.	do	Hardwood interior finishing, etc.
J. J. Stone & Co.	do	Printing and binding.
Greensboro Furniture Co.	do	$125,000.
G. W. Alley Brick Co.	do	2,500,000 brick.
The Brooks Lumber Co.	do	2,000,000 feet lumber.
Julian Milling Co.	Julian	3,000 bbls. flour, 195,000 lbs. feed, 3,000 bus. meal.
Pomona Terra Cotta Co.	Pomona	1,000 carloads terra cotta.
Johnson Bros. Shoe Mfg. Co.	Jamestown	1,350 pairs shoes.
Acme Mill Works	Greensboro	
Hunter Mfg. and Com. Co.	do	
Carolina Spoke and Bending Works	do	1,565,000 spokes, 313,000 handles, 7,825 sets rims, 313,000 picker sticks.
North State Bobbin Co.	do	$25,000.
Southern Bobbin Co.	do	
Guilford Lumber Mfg. Co.	do	
Brooks Lumber Mfg. Co.	do	
Sergeant Mfg. Co. (Foundry)	do	
Guilford Roller Mills	do	23,475 bbls. flour, 46,950 bu. meal.
W. A. Watson & Co. Roller Mill	do	
Van Deventer Carpet Mills	do	1,000,000 yards.
Johnson & Watson Shoe Co.	do	
Globe Plow Co.	do	
D. A. Patrick Brick Machine Co.	do	
Watson & Sink Machine Co.	do	
J. M. Smith Machine Co.	do	
Jennings & Son Machine Co.	do	
Gate City Furniture Co.	do	
American Mfg. Co.	do	12,000 to 18,000 dozen overalls.
Hudson Mfg. Co.	do	
A. E. & E. J. Stafford Tobacco Factory	do	
American Cigar Co.	do	
Grooms Bros. Broom Factory	do	
Pitts & Monroe Lumber Co.	do	
J. W. Knight Marble Works	do	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Guilford County—continued.		
Jas. F. Nolan Marble Works	Greensboro	15 carloads.
G. S. Gaulden Harness Factory	do	
J. E. Cox Shuttle Block Factory	do	
Greensboro Lumber Co.	do	
Greensboro Brick Co.	do	
Greensboro Table and Mantel Co.	do	$50,000.
Greensboro Agricultural Works	do	
Lewis & Son Wagon Works	do	
W. E. Holly Brick Works	do	
W. G. Jennings Brick Works	do	
W. A. Watson Brick Co.	do	
Mendenhall & Clark Brick Co.	do	402,000 handmade brick.
Goose Grease Liniment Co.	do	
Snow Basket Co.	High Point	$15,000.
Eagle Furniture Co.	do	
High Point Coffin and Casket Co.	do	
High Point Chair Co.	do	93,900 chairs.
Piedmont Table Co.	do	
Union Table Co.	do	
Victor Chair Co.	do	
High Point Upholstering Co.	do	$40,000.
Globe Home Furniture Co.	do	$300,000.
Welch Furniture Co.	do	
High Point Bed Spring Co.	do	$20,000.
Alma Furniture Co.	do	$25,000.
High Point Furniture Co.	do	$200,000.
Peerless Machine Works	do	$12,000.
High Point Mantel and Table Co.	do	$100,000.
Southern Chair Co.	do	
High Point Metallic Bed Co.	do	20,000 beds.
American Lumber Co.	do	
High Point Trunk and Bag Co.	do	$30,000.
W. T. Pickett Tobacco Factory	do	
High Point Showcase Works	do	$11,000.
High Point Overalls Co.	do	
High Point Ice and Coal Co.	do	
Lowe Trouser Co.	do	31,300 doz. knee pants, 31,130 doz. youths' suits, 15,650 children's suits.
High Point Machine Works	do	
High Point Pants Co.	do	
Carolina Mfg. Co.	do	
National Lounge and Bed Spring Co.	do	
F. J. Horney Harness Factory	do	
High Point Cabinet and Kitchen Table Co.	do	
Smith Furniture Co.	do	$7,500.
Jamestown Bone Meal Co.	Jamestown	Bone meal.
S. H. Ward & Co.	do	Bone meal.
Champlain Mills	do	
S. H. Ward Cannery	do	
J. R. Richardson	do	
Oakdale Mills	do	
Eugene Armfield Broom Factory	do	
O. C. Benbow	do	2,000 bus. corn, 500,000 ft. lumber.
S. H. Ward Roller Mill	Guilford	
Lowrey & Cude Roller Mill	Oak Ridge	
J. W. Jones Roller Mill	Brown Summit	
C. R. Doggett Roller Mill	do	
Deep River Roller Mills	Deep River	
Mendenhall & Co. Shoe Factory	do	22,000 pounds leather, 7,500 pairs shoes.
Forbis & McLean Broom Handle Works	McLeansville	
M. F. Smith & Gerringer Brick Works	Gibsonville	
J. H. Richardson Buggy Factory	Westminster	
Halifax County—		
Carolina Peanut Co.	Weldon	75,000 bushels.
Weldon Brick and Land Improvement Co.	do	1,750,000 common brick, 75,000 pressed brick.
Chockoyotte Brick Co.	do	1,250,000.
Weldon Lumber Co.	do	12,000,000 feet.
Littleton Lumber Co.	Littleton	250,000.
Garrett & Co.	Weldon	390,000 gallons wine.
Roanoke Nav. and Water Power Co.	do	
Oak Grove Lumber Co.	do	
Weldon Ice Co.	do	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Halifax County—continued.		
Toms & Co. Brick Works	Weldon	
Jenkins & Moody	Scotland Neck	
Scotland Neck Roller Mill	do	
R. J. Madry	do	Fertilizers.
Johnston & Tate	Littleton	Lumber.
House & Bro. Lumber Co.	Thelma	1,000,000 feet.
Forbury Lumber Co.	do	
Kitchin Lumber Co.	Kitchin	
Doiscut & Co. Box Factory	Roanoke Rapids	
N. C. Lumber Co.	Tillery	
W. F. Parker Lumber Co.	Enfield	
Harnett County—		
The John A. Mackay Mfg. Co.	Dunn	
The South Dunn Mfg. Co.	do	
The Oregon Chair Factory	do	$30,000.
Dunn Cotton Oil Co.	do	52,800 lbs. lint, 101,000 gallons oil, 960 tons meal, 900 tons seed.
Dunn Lumber Co.	do	
Cary Lumber Co.	do	
Thornton Buggy Co.	do	
Allen & Wells Cabinet Co.	do	
Young & David Brick Co.	do	
Young & Neighbors Flour Mill	do	
O. P. Shell Flouring Mills	do	
Thos. MacLamb Flouring Mills	do	
E. Lee Harness Co.	do	
Canady & Young Tannery	do	
J. D. Barnes Naval Store Co.	do	
G. I. Smith Cannery	do	12,000 cans tomatoes and peaches.
E. F. Young	do	Fertilizers.
W. M. Sexton Lumber Co.	Longs	
Wm. Johnston Lumber Co.	Buie's Creek	
Z. T. Kivett Brick Co.	do	500,000.
Devereux-Turlington Lumber and Gin Co.	Turlington	200,000 ft. lumber, 766 bales cotton.
J. C. & B. F. Williams	Angier	5,000 gallons spirits turpentine. 180,000 pounds rosin.
D. W. Price Lumber Co.	do	
J. A. Green Lumber Co.	do	
J. R. Young & Bro. Brick Co.	do	
Bradley Bros. Lumber Co.	Bradley's Store	
L. D. Matthews Lumber Co.	do	
N. A. Smith Lumber Co.	do	
Matthews & Smith Lumber Co.	do	
A. G. Blanchard Lumber Co.	May	
L. F. Arnold Lumber Co.	do	
Sexton & Stevens Lumber Co.	do	
G. D. Spence & Son Lumber Co.	do	
J. H. Stewart Lumber Co.	Winslow	100,000 ft. lumber, 75,000 shingles.
R. F. Spence Ginnery	Chalk Level	
Neil McLeod Lumber Co.	Swann Station	
D. A. Stewart Lumber Co.	Legal	
W. W. Allen Lumber Co.	Bunn Level	
Lillington Brick Co.	Lillington	2,000,000 brick.
Marsh & Hockaday Lumber Co.	do	
W. L. McLean Lumber Co.	do	
Lillington Lumber Co.	do	
Haywood County—		
Waynesville Wood Mfg. Co.	Waynesville	
Kaolin Mfg. Co.	do	
Waynesville Brick Mfg. Co.	do	
W. H. Cole Lumber and Mfg. Co.	do	
Junaluska Leather Co.	do	
R. & A. Howell Roller Mill	do	
Morgan Roller Mills	Clyde	
Walker Roller Mills	Crabtree	
J. Holtsclaw Roller Mill	Canton	
Henderson County—		
Hendersonville Mills	Hendersonville	
Pacolet Grape Juice Co.	do	
Breeding Meal and Feed Co.	do	
Hendersonville Blind, Door and Sash Co.	do	$18,000.
T. W. Bennett	do	300,000 feet lumber.
Hendersonville Light and Power Co.	do	
Roper's Mills	Upward	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Henderson County—continued.		
Clayton & Warren Saw-mill	Yale	200,000 feet.
W. T. Bennett Saw-mill	Horse Shoe	
W. B. Ledbetter Cannery	do	
Henderson's Chair Factory	Dewitt	
Asheville Brick and Tile Co.	Fletcher	3,000,000 brick.
Hillerbrand's Brick Factory	do	
P. T. Ward Saw-mill	Dana	
Case & Ward Canning Factory	do	800 cases tomatoes.
S. C. Sitton Shingle-mill	Sitton	
Hertford County—		
W. H. Sears	Union	5,000,000 shingles.
W. P. Taylor Shingle and Lumber Mill	Winton	Shingles and lumber.
Branning Mfg. Co.	Ahoskie	
J. R. Garrett Lumber Co.	do	
W. P. Taylor Lumber Co.	Winton	12,900 feet.
H. S. Basnight Lumber Co.	Harrellsville	
E. C. Worrell Lumber Co.	Murfreesboro	
J. W. Freeman Lumber Co.	do	
Southern Cotton Oil Co.	do	Cotton-seed meal.
James Rountree Lumber Co.	St. John's	
Hyde County—		
Wm. Schuette & Co.'s Mills	Makeleyville	6,000,000 feet timber.
Mattamuskeet Lumber & Shingle Co.	Engelhard	3,000,000 feet lumber, 1,000,000 shingles.
Alex. Spring Lumber Co.	Makeleyville	
Alleghany Lumber Co.	Scranton	
Willie Daniels Lumber Co.	Swan Quarter	
Geo. T. Credle Lumber Co.	do	
A. B. Riggins & Co.	do	
Knickerbocker Lumber Co.	Lake Comfort	
Juniper Bay Lumber Co.	do	
J. E. Spencer Lumber Co.	Engelhard	
J. A. Daxsee & Son	Ocracoke	Clam cannery.
J. C. Simmons Lumber Co.	Fairfield	
Carter Murray & Co. Lumber Co.	do	
Jno. W. Bennette Lumber Co.	do	
Knickerbocker & Ellis	Wysocking	Lumber.
Iredell County—		
City Roller Mills	Statesville	62,600 barrels flour, 435,600 bus. meal.
Statesville Flour Mills	do	
Railroad Flour Mills	do	
Statesville Furniture Co.	do	
Kincaid Furniture Co.	do	
Key & Co. Furniture Co.	do	$100,000.
Statesville Cannery	do	
South Yadkin Flour Mills	do	
Statesville Machine Shop and Foundry	do	
Flanigan Harness Co.	do	5,000 sets harness.
Wise Ginnery	do	
Irwin & Poston	do	Tobacco.
Star Showcase Co.	do	
H. Clark & Sons	do	125,000 pounds plug and smoking tobacco.
L. C. Wagner & Co.	do	Coopers and lumbermen.
J. H. Weston Saw-mill	do	
Hager & King Gin	do	
W. E. Morrison Gin	do	
Lee Morrow Gin	do	
Overcash Bros. Sash, Door and Blind Co.	do	
W. E. Morrison Beech Mfg. Co.	do	
Morrison Bros. Brick Mfg. Co.	do	1,500,000 brick.
Eubanks & Co. Broom Factory	do	
L. Ash Plug Tobacco Factory	do	
Adams, Charles & Co. Tobacco Factory	do	
Turner, Powell & Co. Tobacco Factory	do	
J. H. McClure Tobacco Factory	do	
L. Clark Cigar Factory	do	
S. A. Sharpe Tannery and Harness Co.	do	
The Imperial Furniture Co.	do	
A. R. Simons Veneering Co.	do	
Cotton-seed Oil Mill Co.	do	
Mooresville Flour Mills	Mooresville	
C. K. & W. W. Melchor Flour Mills	do	
G. W. Brown Saw-mill	do	
J. W. Hudson & Son Gin	do	
B. A. Troutman's Gin	do	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Iredell County—continued.		
Templeton, Williams & Co. Gin	Mooresville	
J. A. Butler Roller Mills	Harmony	
Stikeleather & White	do	Lumber.
B. F. Gaither Gin	do	
Bradford & Sons Roller Mill	New Sterling	
Carter Bros. Saw-mill	do	
Bradford & Sons Saw-mill	do	
Bradford & Sons Cotton Gin	do	
Carter Bros. Gin	do	
Yount-Johnson & Co. Gin	do	
Bradford & Sons Tannery and Harness Mfg. Co.	do	
Eagle Roller Mills	Eagle	
Stempson & Co. Saw-mill	do	
J. E. Stempson & Co. Gin	do	
J. E. Myers Roller Mill	Eupeptic Springs	
Turnersburg Roller Mills	Turnersburg	
Stempson & Steele Saw-mill	do	
Stempson & Steele Gin	do	
C. A. & N. D. Tomlin Gin	do	
J. H. Troutman Roller Mill	Long Ford	
Jackson County—		
The Harris Rees Tanning Co.	Sylva	30,000 hides per annum.
Dillsboro Milling and Mfg. Co.	Dillsboro	25,000 bus. corn, 50,000 bus. wheat, 5,000 bus. rye.
Tuckaseegee Kaolin Co.	do	A developed mine but not yet operating.
Cullowhee Copper Co.	Cullowhee	
The Harris Clay Co.	Dillsboro	
Gilliland Locust Pin Co	do	
C. J. Harris Tannery	do	
Kaolin Mfg. Co.	Waynesville	
National Abrasive Co.	do	
Ed. Tustin Clay Factory	Sylva	
Johnston County—		
J. H. Edgerton Co.	Smithfield	1,000 cans per day.
Brooklyn Mfg. Co.	do	5,000,000 feet.
W. M. Sanders Brick-yard	do	1,000,000 brick.
Southern Cotton Oil Co.	Selma	3,000 tons seed consumed.
C. M. & W. G. Wilson, Sash, Door and Blind Factory	Wilson's Mills	$35,000.
Pine Level Oil Mill	Pine Level	100,000 gals. oil, 800 tons meal, 700 tons hulls, 150 bales linters.
Selma Brick Co.	Selma	20,000,000 brick annually.
S. S. Earl Co	Kenly	New plant.
Holt & Wall Sash, Door and Blind Co.	Wilson's Mills	
Selma Oil and Fertilizer Works	Selma	
N. E. Ward Brick Factory	do	
Selma Mfg. Co.	do	Lumber.
Holt's Flour and Grist-mill	Smithfield	
John R. Creech's Flour and Grist-mill	do	
Clayton Mfg. Co.	Clayton	Lumber.
J. W. Hocutt Shingle and Lumber Plant	Emit	
J. D. Eason Lumber Co.	Easons	
Jones County—		
John Pearce Gin and Grist-mill	Polloksville	642 bales ginned, 7 500 bus. meal.
C. A. Rhodes Gin and Saw-mill	Comfort	500 bales ginned; umber sold, $2,500.
A. J. Collins Gin	Maysville	
Lewis Bynum Gin	do	
Charles McDaniel Saw-mill	Polloksville	
E. L. Houghton Gin	do	
J. N. Foscue Gin	do	
Charles McDaniel Mill	do	
M. N. Harriett Gin and Mill	do	
J. B. Banks Gin and Mill	Polloksville	
J. J. Simmons Gin and Mill	Olivers	
J. C. Parker Gin and Mill	do	
F. Brock Gin and Mill	Trenton	
J. H. Wooten Gin and Mill	do	
J. F. Noble Gin	do	
F. A. Whitaker Gin	do	
Spence Philips Gin	do	
F. B. Koonce Gin	Comfort	
N. B. Hargett Gin	Tuckahoe	
W. G. Fordham Gin	do	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Lenoir County—		
Hines Bros. Lumber Co.	Kinston	11,000,000 feet.
Ellis Carriage Works	do	1,100 buggies.
Carolina Brick Co.	do	12,000,000 brick.
S. H. Isler, Jr.	do	$2,100.
C. T. Randolph	do	1,000 vehicles.
Kinston Furniture Co.	do	$60,000.
Gay Lumber Co.	do	10,000,000 feet.
Moseley Brick and Lumber Co.	do	1,500,000 brick, 2,000,000 shingles.
Kinston & Clark Brick and Tile Co.	do	5,500,000 brick.
Lenoir Oil and Ice Co.	do	Cotton-seed meal.
Neuse Milling Co.	do	
Harrell Cart and Wagon Factory	do	
Harvey and Chadwick Mantel Co.	do	$10,000.
Lincoln County—		
Howard's Creek Mill	Reepsville	2,500 bushels meal.
Pioneer Roller Mills	Lincolnton	
Piedmont Roller Mills	do	
Motz Furniture Co.	do	
Lincolnton Machine Shops	do	
Lander Roller Covering Co.	do	
Griggs Mfg. Co.	do	
Warlick Roller Mills	Reepsville	
Denver Roller Mills	Denver	
Mullen Roller Mills	Deer	$2,000.
Orleans Roller Mills	Orleans	
Indian Creek Roller Mills	Henry	
Indian Creek Lumber Co.	Dora	
McDowell County—		
Blue Ridge Furniture Co.	Marion	$75,000.
Catawba Furniture Co.	do	$144,000.
Western Furniture Co.	do	$36,000.
McCall Roller Mill	do	300,000 pounds flour, 13,500 lbs. bran, 7,500 bushels meal.
McDowell Furniture Co.	do	$60,000.
The Blue Ridge Furniture Co.	do	
Payne & Decker Novelty Factory	do	
Blue Ridge Distillery	do	25,200 gallons whiskey.
W. W. Cooper Rectifier	do	
Bennett & Morgan Rectifier	do	
Hudgins & Martin Brick Co.	do	1,000,000.
Cane Creek Roller Mills	Kirksey	104,000 pounds.
The U S. Leather Co.	Old Fort	
Old Fort Extract Works	do	45,950 barrels tannic acid.
P. J. Sinclair Roller Mills	Muddy Creek	
W. E. Patton	Garden City	
Murray Lumber Co.	Elberman	67,000,000 feet.
Macon County—		
Lyles Mills	Franklin	
H. G. Trotter Pin Co.	do	500,000.
J. G. Siler Grist and Feed-mill	do	4,000 bushels.
John A. Tatham Saw-mill	Eulalie	1,000,000 feet.
The Nantahala Co.	Franklin	3,500,000 pins.
J. L. & W. J. West Mill	West Mills	8,000 bushels wheat and corn.
Alex. Bell Wood-working and Grist-mill	Cullasaja	
Gilliland Locust Pin Co.	Franklin	
J. F. Palmer Carriage Co.	do	
Potts Carriage Co.	do	
R. C. Green Furniture Co.	do	
J. F. Kennedy Furniture Co.	do	
J. P. Bryson Grist-mill	do	
Harris Roller Mills	do	
J. P. Angel Harness Co.	do	
L. K. Moffit Wood-working Co.	do	
Charles Cabe Wood-working Co.	do	
Myers Bros. Wood-working Co.	Franklin	
George Campbell Wood-working Co.	do	
M. D. Billings Mica Co.	do	$4,160.
Stalcup Furniture Co.	do	
Ravenel Locust Pin Co.	Victory	
B. M. Angel Grist-mill	Higdonville	
J. A. Higdon Grist-mill	do	
Union Lumber Co.	Jarretts	
A. J. Moore Lumber Co.	Ellijay	
Thos. M. Slagle Lumber Co.	Crawford	
Daniel Ravenel Pin Co.	Highlands	
W. M. Edwards Grist and Saw-mill	Burningtown	
M. C. Caldwell Lumber Co.	Leatherman	3,000,000 feet.
Collins Bros. Mills	Iotla	500 bus. wheat, 600 bus. corn.

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Madison County—		
N. C. Land and Timber Co.	Stackhouse	
Marshall Milling Co.	Marshall	
Carolina Mineral Co.	do	
Martin County—		
Hamilton Pants Mfg. Co.	Hamilton	30,000 pairs pants.
D. B. Parker Buggy Co.	Robersonville	$20,000.
The Dennis Simmons Lumber Co.	Williamston	24,500,000 feet lumber.
Williamston Ginning and Milling Co.	do	
R. S. Critcher Saw-mill	do	
J. H. Gurganus Shingle-mill	do	
W. H. Daniel Saw and Grist-mill	do	
J. L. Woolard Saw-mill	do	
Seth W. Mizzell Saw-mill	do	
J. L. Woolard Cultivator Factory	do	
Everetts Lumber Co.	Everetts	
D. J. Cherry Lumber Co.	do	
C. James Lumber Co.	do	
Jas. W. Leggett Saw-mill	Palmyra	
Jas. W. Cooper & Bros. Saw-mill and Gin	Conoho	
J. H. Eubank's Saw-mill	Hassells	
B. H. Robertson Lumber Co.	Gold Point	
R. T. Taylor Carriage Factory	do	
Wiley Bogerson Milling Co.	Robersonville	2,000,000 ft. lumber, 4,000 bus. corn.
J. R. Woolard Saw-mill	do	
Boyle Mfg. Co.	Jamesville	1,000,000 feet lumber, 3,000,000 shingles.
Robert White Gum-mill	do	2,888,000 feet lumber.
J. L. Coltraine Saw-mill	do	
C. C. Fagan Saw-mill	Dardens	
Mecklenburg County—		
Southern Cotton Oil Co.	Davidson	2,500 tons seed.
The Charlotte Trouser Co.	Charlotte	
The Park Mfg. Co.	do	Machine shop and foundry.
Charlotte Casket Co.	do	
J. H. Wearn & Co.	do	$100,000.
Southern Pants Co.	do	
Mecklenburg Iron Works	do	
Charlotte Ore Co.	do	12,000 tons.
Southern Card Clothing and Reed Co.	do	15,000 loom reeds, 30,000 lg. feet card cloth.
Carolina Mfg. Co.	do	Mixed paints.
The Cole Mfg. Co.	do	Seed planters.
Charlotte Oil and Fertilizer Co.	do	
Piedmont Clothing Co.	do	3,130,000 pairs pants.
Liddell Co.	do	Machinery.
Fasnecht & Cathey	do	
Dixie Pants Co.	do	
Standard Ice and Fuel Co.	do	
Highland Park Mfg. Co.	do	Cotton-seed meal.
N. C. Cotton Oil Co.	do	Cotton-seed meal.
Phila. Candy Factory	do	
Relay Mfg. Co.	do	
Southern Cotton Oil Co.	Davidson	Cotton-seed meal.
Mitchell County—		
W. M. Ritter Lumber Co.	Saginaw	15,000,000 feet lumber.
Cranberry Coal and Iron Co.	Cranberry	60,000 tons iron ore.
Mica Mill	Plum Tree	
Iron Mines and Lumber Plant	Cranberry	
Montgomery County—		
Star Machine Co.	Star	$10,000.
Wright & Sons' Mill	do	2,000,000 feet lumber.
Guilford Lumber Mfg. Co.	Troy	3,000,000 feet dressed lumber, 4,000 doors and 2,500 pairs sash.
Ether Wagon Co	Ether	$1,000.
Freeman's Saw Mills	do	$10,000.
Wade & Sons' Mills	Roberdell	3,000,000 feet pine, poplar and oak.
McAuley Roller Mills	Mt. Gilead	50 barrels flour, 100 bushels meal.
Allen Roller Mill	Martin Mill	
W. W. Mills Mfg. Co.	Bisco	
The Bedding Lumber Co.	Troy	
Smitherman Roller Mill	do	
Penn Lumber Co.	do	
Montgomery Roller Mills Co.	Star	
Star Lumber Co.	do	
Ether Lumber Co.	Ether	2,000,000 feet.
Star Lumber and Mfg. Co.	Ashboro	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Moore County—		
Jonesboro Mills	Jonesboro	
Jonesboro Sash and Blind Co.	do	$36,000.
Foushee & Snypes Buggy Co.	do	
Tyson & Jones Buggy Co	Carthage	2,000 vehicles.
Carthage Sash and Blind Co.	do	
Currie & McQueen Lumber Co.	do	9,390,000 feet.
Carthage Furniture Co.	do	$12,000
Kivett Brick Co.	do	500,000 brick.
Moore County Brick Co.	Southern Pines	2,000,000 brick.
I. L. Hamlin Co.	do	Lumber.
Tar Bell Lumber Co.	Aberdeen	
Penn Lumber Co.	do	
Aberdeen Spiritine Co.	do	
Sanford Furniture Co.	Sanford	
Sanford Sash and Blind Co.	do	
Sanford Brick Co.	do	
Fitts-Crabtree Furniture Co.	do	$30,000.
Sanford Clothing Mfg. Co.	do	
Petty Fruit Growing and Canning Co.	Cameron	
Carolina Mill Stone Co.	do	
Elsie Lumber Co.	Hemp	
McDonald Bros. Veneering Co.	West End	
Jackson Springs Co.	Jackson Springs	
Lakeview Townsite Co.	Lakeview	
Nash County—		
H. Powell Lumber Co.	Nashville	30,000 feet per day.
Tar River Lumber Co.	Rocky Mount	11,000,000 feet.
Swift Creek Dairy and Stock Farm	Battleboro	$2,750.
Rocky Mount Sash and Blind Co.	Rocky Mount	$37,000.
Rocky Mount Mfg. Co.	do	Coffins.
Rocky Mount Oil and Fertilizer Works	do	Fertilizers.
Battleboro Oil Mills	Battleboro	70,000 gallons oil, 13,000 sacks meal, 100 bales linters.
Farmers' Oil Mill	Nashville	
Spring Hope Gin Co.	Spring Hope	
New Hanover County—		
Angola Lumber Co.	Wilmington	20,000,000 feet.
The Fore & Foster P. M. S. & B. Co.	do	$75,000.
Hilton Lumber Co.	do	14,000,000 feet.
Boney & Harper Milling Co.	do	375,000 bushels.
Spiritine Chemical Co.	do	Oils, etc.
Calder Bros.	do	Fertilizer material.
Willard Bag and Mfg. Co.	do	2,815,000 bags, 8,500 dozen overalls.
Cape Fear Lumber Co.	do	30,000,000 feet.
Pine Product Co.	do	625 gals. turpentine, 3,500 gals. creosote per month.
Kidder Lumber Co.	do	3,000,000 feet.
Ernest V. Richards Glass Works	do	$5,000.
Cape Fear Mfg. Co.	do	15 doz. pants, 50 doz. shirts, 40 doz. drawers, 40 doz. overalls monthly.
The Independent Ice Co.	do	17,160 tons ice.
Navassa Guano Co.	do	60,000 tons fertilizers.
E. V. Richards Art Glass Works	do	
American Chemical and Textile Color'g Co.	do	600 tons.
C. H. Dock & Co.	do	Turpentine.
The George L. Morton Co.	do	
Navassa Guano Co.	do	90,000 tons.
Olive Canning Co.	do	
Hydraulic White Brick Co.	do	
Angola Lumber Co.	do	
Pittsburg Lumber Co.	do	9,000,000 feet.
Pannell Paint and Paint Solder Co.	do	
A. H. Slocumb Cooperage Co.	do	
W. E. Worth & Co.	do	2,010 tons ice in six months.
V. B. Britton Shingle Co.	do	
Wilmington Stamp Works	do	
The Snead Co.	do	Mattress.
Skinner's Ship Yard	do	
Wilmington Iron Works	do	
N. C. Cotton Oil Co.	do	Cotton-seed meal.
Atlantic Mfg. Co.	do	Baking powder.
R. W. Hicks	do	Cider and vinegar.
E. Warren & Son	do	Candy.
C. W. Yates & Co.	do	Picture frames.

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
New Hanover County—continued.		
J. O. Brown	Wilmington	Vehicles.
Hanover Iron Works	do	
Red Cross Medicine Co.	do	
Sterling Mfg. Co.	do	23,400 dozen shirts.
P. H. Hayden Carriage Factory	do	
N. F. Parker Mattress Factory	do	
Powers, Gibbs & Co.	do	Fertilizers.
R. N. Sweet	do	Fertilizers.
Wilmington Stone and Construction Co.	do	
Northampton County—		
Pleasant Hill Gin Co.	Pleasant Hill	New plant.
Jackson Milling Co.	Jackson	
Farmers Gin and Milling Co.	Rich Square	Lumber, corn meal, carts, etc., doors and windows, cotton-seed products, etc.
Garysburg Mfg. Co.	Garysburg	7,000,000 feet lumber.
Woodland Mfg. Co.	Woodland	
Jackson Buggy Co.	Jackson	
Onslow County—		
I. E. Ketchum Mills	Jacksonville	200,000 feet.
Warner Lumber Co.	Folkstone	6,000,000 feet.
Swansboro Lumber Co.	Swansboro	6,000,000 feet.
N. R. Deppe Mill	Deppe	4,500,000 feet.
J. F. Boggs Turpentine Distillery	Catherine Lake	500 barrels crude turpentine.
A. M. Prince Saw and Planing Mill	Holly Ridge	150,000 feet.
M. R. Sabestan Saw-mill and Gin	Deppe	
R. D. Thompson Saw-mill	Richland	
J. W. Mills Saw-mill and Gin	do	
W. H. Banks Gin	do	
Hudson & Strange Saw-mill	Catherine Lake	
S. B. Taylor Turpentine Distillery	do	
O. B. Cox Turpentine Distillery	do	
Marine Saw-mill	Marine	
Marine Gin	do	
J. D. Batts Turpentine Distillery	Holly Ridge	
Albert Reece Grist-mill and Gin	Jacksonville	
Blades Lumber Co.	do	
Pine Lumber Co.	do	
Kitchin & Shepard Lumber Co.	do	
I. N. Henderson Saw and Grist-mill and Gin	Hubert	
D. J. Sanders Gin	do	
A. H. Slocumb & Co. Turpentine Distillery	do	
Montford Saw and Grist-mill and Gin	Ward's Mill	
Glenco Stock Farm Gin	Verona	
E. H. Maston Grist-mill	Sparkman	
E. H. Maston Turpentine Distillery	do	
B. F. Hall & Co. Gin	Tar Landing	
B. F. Hall & Co. Turpentine Distillery	do	
Orange County—		
Hillsboro Milling Co.	Hillsboro	
Efland Milling Co.	Efland	25,040 bus. wheat, 18,780 bus. corn.
Pamlico County—		
The Defiance Box Co.	Oriental	$100,000.
J. B. Reel Gin, Saw and Grist-mill	Reelsboro	250 bales cotton ginned, 300 barrels corn ground.
Bayboro Land and Lumber Co.	Bayboro	
Reel, Jones & Brinson Saw-mill	Reelsboro	
S. M. Delamar Grist-mill	do	
J. F. Crowell Cotton Gin	Bayboro	
E. H. Pickles Shingle and Saw-mill	do	
Cowell, Swan & McCotter Co.	do	Fertilizers.
A. Midgett	Oriental	Barrels.
W. H. Powers & Co. Gin and Grist-mill	do	
W. B. Blades Lumber Co.	do	
R. D. Hodges Cotton Gin	do	
J. B. Lee & Son	Arapahoe	Barrels.
Reel & Reel Gin and Grist-mill	do	
J. B. Watson Gin and Grist-mill	Lowland	
H. L. Watson Gin and Grist-mill	do	
D. C. McCotter & Bro., Gin and Grist-mill	Mesic	
J. C. Muss Gin and Grist-mill	Vandemere	
S. F. McCotter & Bro., Gin and Grist-mill	do	
W. E. Lukens Saw-mill	do	
Martin-Wagner Canning Factory	do	
C. H. Swan Gin and Grist-mill	Merritt	
C. H Fowler & Co. Gin and Grist-mill	do	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Pamlico County—continued.		
W. E. Lukens Saw-mill	Stonewall	
C. H. Fowler Gin and Saw-mill	do	
Wood & Dean Saw-mill	Pamlico	
J. T. Davenport Cotton Gin	do	
N. H. Banks Gin and Saw-mill	Grantsboro	
S. Campen Gin and Saw-mill	Alliance	
G. R. Brinson Gin and Saw-mill	Baird's Creek	
Pasquotank County—		
Southern Roller and Stave Co.	Elizabeth City	160,000 rollers.
Knobbs Creek Lumber Co.	do	800,000 feet.
Kramer Bros. & Co.	do	
Purity Ice Co.	do	10 tons per day.
The N. C. Tray and Basket Co.	do	12,000,000 tin edge butter trays, 1,500,000 feet dressed lumber, 60,000 potato barrels, 50,000 pea baskets.
Elizabeth City Mfg. Co.	do	
Elizabeth City Buggy Co.	do	300 buggies.
Blades Lumber Co.	do	20,000,000 feet, mostly dressed.
T. A. Commander & Sons	do	
The Elizabeth City Packing Co.	do	Oysters and vegetables.
Thompson Brick Works	do	
East Coast Cedar Co.	do	23,475,000 shingles, 12,520 feet lumber.
The Ball Cultivator Co.	do	
Elizabeth City Brick Co.	do	
Elizabeth City Barrel Factory	do	
Elizabeth City Iron Works	do	
Crystal Ice and Coal Co.	do	
Elizabeth City Plow Co.	do	
Hinton Shingle Co.	do	
Pender County—		
Pender Lumber Co.	Burgaw	
Sanderson & Turner Shingle Mill	do	6,000,000 cypress shingles.
J. W. Smith Saw-mill	do	
W. L. Monroe Crate Factory	Currie	
E. A. Howes Shingle-mill	Atkinson	2,500,000 shingles.
Fitzhugh Lumber Co.	South Wash'ton	3,000,000 feet.
D. W. Southerland Saw-mill	Willard	
Angola Lumber Co.	do	
J. H. Griffin Saw-mill	Sloop Point	
J. B. Davis Shingle Mill	Rocky Point	
W. M. Corbett Shingle Mill	Olga	
J. W. S. Robinson Saw-mill	Delta	
Perquimans County—		
Albemarle Lumber Co.	Hertford	16,000,000 feet.
Walter White Mill	Belvidere	600,000 shingles, 200,000 feet sawed timber.
Hertford Cotton Oil Co.	Hertford	1,247,500 pounds meal, 1,364,438 pounds hulls, 72,053 gallons oil, 67,628 pounds lint.
Major & Loomis Co.	do	6,000,000 feet pine lumber.
W. H. Ward Coffin Co.	do	
McMullen Bros. Buggy Co.	do	
Albemarle Ice Co.	do	2,700 tons.
Hertford Coffin Co.	do	
James Towe Shingle Co.	Chapanoke	
G. F. Derriellson	do	
A. R. Winslow	Winfall	
D. G. Newley	Durant's Neck	
Person County—		
Roxboro Cannery	Roxboro	
Roxboro Planing Mills	do	
R. W. Massie Planing Mill	do	
Chub Lake Roller Mills	Chub Lake	
Massie Saw-mill	Allensville	
Pitt County—		
Winterville Canning Co.	Winterville	500 cases.
D. D. Overton	Greenville	4,000 hogsheads.
W. P. Jordan Co.	do	
The Euvita Co.	do	
Grifton Transportation Co.	Grifton	
Randolph County—		
Dixie Chair Co	Trinity	$21,000.
Crown Milling Co.	Ashboro	7,000 barrels flour, 3,000,000 feet lumber.
Alberta Chair Works	Ramseur	$35,000.

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Randolph County—continued.		
A. W. Fuller Mills	Fullers	25 barrels flour, 20 bushels corn meal daily.
Ashboro Bobbin Co.	Ashboro	$75 to $100 per day.
Randolph Chair Co.	do	100 dozen chairs per week.
Franklinville Mfg. Co.	Franklinville	$4,000.
Liberty Milling Co.	Liberty	7,000 barrels flour, 10,000 bushels meal.
Ashboro Roller Mills	Ashboro	80 barrels flour, 60 bags feed, 150 bushels meal per day.
Home Building and Material Co.	do	Doors, blinds, sash and building material.
Pearl Roller Mills	Randleman	5,040 barrels flour.
Naomi Falls Roller Mills	do	
Ashboro Furniture Co.	Ashboro	
Ashboro Lumber Mfg. Co.	do	
Plant City Lumber Co.	do	
Ashboro Canning Co.	do	500,000 cans tomatoes, 10,000 bushels peaches.
Archdale Roller Mills	Archdale	
Ramseur Roller Mills	do	
A. N. Roller Mills	New Salem	
Franklinville Roller Mills	Franklinville	
Enterprise Roller Mills	Enterprise	
Uwharie Roller Mills	do	
Julian Roller Mills	Julian	
Caraway Roller Mills	Caraway	
Richmond County—		
Hoffman Distilling Co.	Hoffman	1,000 barrels whiskey.
J. B. Caudle Co.	Rockingham	$60,000.
Robeson County—		
Alma Lumber Co.	Alma	4,000,000 feet.
Maxton Sash and Door Co.	Maxton	$5,000.
J. L. Townsend & Co. Saw-mill	Purvis	1,200,000 feet.
Lumberton Cotton Oil and Ginning Co.	Lumberton	
C. F. Pate & Co. Ginnery	Purvis	900 bales cotton.
St. Paul Ginnery	St. Paul	450 bales cotton.
J. T. Brown Grist-mill	Red Springs	1,800 bushels.
Lytch Meat Cutter	Rowland	
W. B. Stubbs Shops	Purvis	Repairing.
Red Springs Gin Co.	Red Springs	1,455 bales cotton.
Southern Saw-mill	Kingsdale	12,000,000 feet dressed timber.
Price & Davis Cotton Gin	Ashpole	445 bales cotton.
J. E. Clifton Repair Shops	Lumber Bridge	$2,500.
Red Springs Oil and Fert. Co.	Red Springs	320 tons meal and 40 bales lint.
Red Springs Lumber Co.	Red Springs	3,000,000 feet lumber.
W. H. Graham Ginnery	Rowland	325 bales cotton.
N. A. Brown Machine Shop	Pates	
R. W. Livemore Gin	do	
R. W. Livemore Grist-mill	do	
A. L. & B. F. Bullock Machine Shops	Alfordsville	
C. B. Cox & Co. Gin	do	
C. B. Cox & Co. Grist-mill	do	
J. MacJohnson Machine Shops	do	
J. W. Hall Gin	do	
J. H. McEachern Gin	do	
N. Shaw Gin	do	
J. H. McEachern Grist-mill	do	
Breece & McCormick	Pembroke	1,000,000 feet lumber.
Harry McQueen Machine Shops	Lumberton	
Pink Campbell Gin	do	
Quinn Warwick Gin	Lumberton	
S. A. Edmund Grist-mill	do	
J. Daniel Revels Machine Shop	Rozier	
Dr. S. B. Rozier Gin	do	
Southern Saw-mills and Lumber Co.	Purvis	
J. E. Tyson	Bellamy	
Gregory Lemon Grist-mill	do	
J. W. Webster & Son	Rowland	
W. H. Graham Gin	do	
H. K. McCormac Gin	do	
Rowland Gin Co.	do	
W. J. Cooley Harness Co.	do	
Rowland Oil and Fertilizer Co.	do	Cotton-seed meal.
H. K. McCormac Grist-mill	do	
Neill Alford Gin	Floral College	
W. R. McKay Gin	do	
Neill Alford Grist-mill	do	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Robeson County—continued.		
R. A. Andrews & Co. Gin	Ashpole	
C. A. Inman Gin	do	
Joe Barnes Gin	do	
Jenkins and Pitman Gin	do	
R. A. Andrews & Co. Grist-mill	do	
Hybert Atkinson Gin	Leesville	
Hybert Atkinson Grist-mill	do	
Rev. K. Barnes Gin	Sterling	
McPherson Buie Gin	Red Springs	
McKinnon & Livermore Gin	do	
A. T. McCallum Gin	do	
J. F. McKay Gin	do	
Mrs. A. M. D. McNeill Gin	do	
W. M. Roberts Gin	do	1,267 bales.
Tom Brown Grist-mill	do	
Mrs. S. J McCormick Grist-mill	do	
Red Springs Lumber Co.	do	3,500,000 feet.
James Butler Gin	Tolarsville	
James Butler Grist-mill	do	
C. C. Dew Gin	Raeford	
Allen Edens Gin	Echo	
Mrs. L. A. Edmund Gin	Charm	
Mrs. L. A. Edmund Grist-mill	do	
A. D. Evans Gin	St. Paul	
Robt. McGeachy	do	
Opie Odum Gin	do	
A. R. McEachern Grist-mills	do	
L. Shaw Flour Mills	do	
Dr. O. C. Faulk Gin	Refuge	
R. J. Fletcher Gin	Wakulla	
J. K. McGrit Gin	do	
J. R. Floyd Gin	Barnesville	
J. M. Graham Gin	Pike	
J. M. Graham Grist-mill	do	
L. R. Hamer Gin	Fulmore	
L. R. Hamer Grist-mill	do	
W. C. Hamer & Son Gin	John's Station	
W. C. Hamer & Son Grist-mill	do	
H. H. Hodgin & Son Gin	Antioch	
J. A. Hodgin Gin	do	
H. H. Hodgin & Son Grist-mill	do	
J. A. Hodgin Grist-mill	do	
W. A. Leggett Gin	Nye	
W. A. Leggett Grist-mill	do	
A. D. McLean Gin	Branchville	
J. B. Lewis Gin	Inman	
Thomas McBryde Gin	Ryan	
Thomas McBryde Grist-mill	do	
McMillan & Hughes Gin	Parkton	
Alex. McRae Gin	Red Bluff	
McKimmon & Gaddy Gin	Morrosenia	
A. C. Oliver Gin	Affinity	
J. S. Oliver Gin	do	
Oscar Page Gin	do	
Timothy Page Gin	do	
J. F. Parker Gin	McDonalds	
Price & Davis Gin	Iona	
D. M. Rogers Gin	Rochester	
J. C. Rowan & Co. Gin	Grady	
G. L. Thompson Gin	Grady	
J. L. Willoughby Gin	do	
L. Shaw Gin	St. Paul	
Seth Smith Gin	Sessoms	
S. J. Smith Gin	Raynham	
B. Stansel Gin	Allenton	
D. L. Stewart Gin	Alma	
J. C. McCaskill Cotton Stalk Cutter Co.	Maxton	
Rockingham County—		
Fagg Bros.	Madison	1,000,000 feet timber.
B. F. Ivey	Leaksville	Tobacco.
A. H. Motley Co.	Reidsville	250,000 pounds tobacco.
F. R. Penn Tobacco Co.	do	
Robt. Harris & Bro.	do	1,500,000 pounds tobacco.
R. P. Richardson, Jr.	do	
Honduras Mfg. Co.	do	
Reidsville Fertilizer Co.	do	Fertilizers.
American Garment Mfg. Co.	Spray	50,000 dozen garments.

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Rockingham County—continued.		
American Warehouse Co.	Spray	40,000,000 yds. finished cot. goods.
D. F. King	Leaksville	
J. B. Taylor	do	
R. F. Stone Tobacco Co.	Stoneville	
J. A. Benton	Ruffin	Fertilizers
Rowan County—		
Rockwell Furniture Co.	Rockwell	$15,000.
C. A. Rice Lumber Co.	Salisbury	$30,000.
Rowan Mattress Works	do	300 mattresses per week.
The Brown Furniture Co.	do	$25,000.
Mill Bridge Roller Mill	China Grove	2,000 bbls. flour, 200 tons bran.
Peacock & Graff Sash, Door and Blind Co.	Salisbury	
P. H. Thompson Sash, Door and Blind Co.	do	
Nussman & Heilig Sash, Door and Blind Co.	do	
G. W. Isenhour Brick Co.	do	
W. D. Watson Brick Co.	do	
Salisbury Ice and Fuel Co.	do	7,825 tons ice.
Salisbury Roller Mill	do	
Northside Roller Mill	do	
Salisbury Brick and Tile Co.	do	
Salisbury Mattress Co.	do	
Mt. Ulla Roller Mills	Mt. Ulla	
China Grove Roller Mills	China Grove	17,215 barrels, 1,252 tons feed.
Cleveland Veneering Mfg. Co.	Cleveland	
Rutherford County—		
Hyder Mfg. Co.	Forest City	$10,000.
Oak Wood Mfg. Co.	Rutherfordton	$60,000.
D. R. Stinson Shuttle Factory	do	100,000 shuttle blocks.
Warlick Lumber Co.	Gilkey	3,750,000 feet lumber and building material.
C. M. Champion Roller Mills	Rutherfordton	3,000 bushels.
Rutherfordton Mfg. Co.	do	2,000,000 feet lumber, 5,000 doors, 6,000 sash.
R. P. Geer Roller Mills	Gilkey	3,000 bushels.
Z V. Geer Roller Mills	Forest City	
T. F. Elliott Roller Mills	Hollis	
Sampson County—		
A. F. Johnson Crate Factory	Clinton	
W. B. Stewart Saw-mill	do	
David Boney Saw-mill	do	
E. T. Turlington Saw-mill	do	
E. T. Turlington Saw and Grist-mill	do	
R. B. Smith Saw and Grist-mill	do	
L. A. Williams & Co. Saw-mill	Newton Grove	
Arthur Lee Saw-mill	do	
J. M. Britt Saw and Grist-mill	do	
Alex. Herring Saw-mill	Blake	
A. Vann Saw and Grist-mill	do	
Jasper Weeks Saw and Grist-mill	Kenner	
Scotland County—		
Laurinburg Oil Co.	Laurinburg	200,000 gallons oil, 2,000 tons meal, 2,000 tons hulls, 75,000 lbs. lint.
Southern Cotton Oil Co.	Gibson	Cotton-seed meal.
Stanly County—		
American Roller Mill Co.	Richfield	1,500 barrels flour.
Tucker & Carter Rope Co.	New London	500,000 pounds rope.
Plyer Milling Co.	Plyer	60 barrels flour daily.
J. I L. Efird Mills	Whitley	10,000 bushels.
Harwood Roller Mills	Bridgeport	
Albemarle Furniture Mfg. Co.	Albemarle	
Albemarle Roller Mills	do	
I. W. Suggs Machine Shops	do	
Sibley Bros. Machine Shops	do	
Port Roller Mills	Millingport	
Big Lick Roller Mills	Big Lick	
Miller Bros. Roller Mills	Dowd	
Norwood Milling Co.	Norwood	2,000 bus. wheat, 4,000 bus. corn.
Stokes County—		
Sheppard Bros.	Dellar	
Fogg Bros.	Walnut Cove	Lumber.
Surry County—		
Elkin Furniture Co.	Elkin	$20,000.
Rucker & Witten Tobacco Co.	Mt. Airy	2,000,000 pounds.
Mt. Airy Furniture Co.	do	$165,000.
Banner Mfg. Co.	do	$20,000.
J. F Kirkman Shops	Pilot Mountain	$1,000.

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Surry County—continued.		
Dobson Buggy Co.	Dobson	40 new buggies and 60 repaired.
Cooper Lumber Co.	Salem Fork	$900.
Southern Tobacco Co.	Pilot Mountain	25,000 pounds.
Banner Mfg. Co.	Mt. Airy	Chairs, cradles, tobacco boxes.
National Furniture Co.	do	
Mt. Airy Granite Co.	do	
Worth & Worth Mill Co.	do	
Mrs. A. E. Sides Milling Co.	do	
J. E. Spaugh Foundry	do	
Spaugh & Bussic Co.	do	
Prather-Whitlock Tobacco Co.	do	
Mt. Airy Buggy Co.	do	
James Shoub Wagon Co.	do	
R. D. Harris & Bro. Wagon Co.	do	
Pilot Furniture Co.	Pilot Mountain	$50,000.
Dobson Mill Co.	do	
Redmon & Mitchell Mill Co.	do	
Elkin Canning Co.	Elkin	100,000 cans.
Elkin Chair Co.	do	5,000 dozen.
Bailey Mfg. Co.	do	
W. R. Doss	Copeland	
Whiteplains Buggy Co.	Whiteplains	$6,000.
S. E. Marshall Wagon Co.	do	
J. S. Marshall Lumber Co.	do	
J. S. Marshall Lumber Co.	Dobson	
Siloam Roller Mills	Siloam	
J. D. Hamlin Roller Mills	Rockford	
Westfield Roller Mills	Westfield	
C. H. Cummings Lumber Co.	Rusk	
Dobbins Roller Mills Co.	do	
Swain County—		
Double Stationary Circular Saw-mill	Nantahala	7,500,000 feet building material.
N. C. Talc Mining Co.	Hewitt's	3,000 tons.
G. W. Moore & Co.	Bryson City	
A. J. Franklin	do	Lumber.
W. L. Ellis	Almond	
J. L. Floyd Lumber Co.	Ocona Lufty	
O. D. Hart	Loveta	
W. A. Gee	Gee	
Ben Fry	Wesser	
E. B. Jenkins	Judson	
Transylvania County—		
The Brevard Roller Flour Mill	Brevard	3,600 bushels.
Brevard Tannery Co.	do	10,460 hides.
Toxaway Canning Co.	Toxaway	
Blue Ridge Locust Pin Co.	do	
Tyrrell County—		
H. H. Phelps Mill	Bay	6,000 per day.
Pine Lumber Saw-mill Co.	Columbia	
Newberry Buggy and Cart Co.	do	
D. A. Sample Buggy and Cart Co.	do	
R. I. Hassell Saw, Shingle and Grist-mill	do	
A. W. Owens Grist-mill and Gin	do	
Phelps Lumber and Shingle Co.	Creswell	
Fleetwood & Jackson Lumber Co.	Gudger	
J. L. Roper Lumber Co.	do	
Union County—		
Piedmont Buggy Co.	Monroe	1,000 vehicles.
Waxhaw Roller Mills	Waxhaw	6,000 barrels.
Southern Cotton Oil Co.	Monroe	Cotton-seed meal.
Henderson Roller Mills	do	10,000 bbls. flour, 20,000 bus. corn.
Shute & Son Sash and Blind Factory	do	
Union Mfg. Co.	do	
Waxhaw Oil and Fertilizer Co.	Waxhaw	
J. W. Love Roller Mills	Long Store	
W. A. Love Roller Mills	Unionville	
Marshville Roller Mills	Marshville	
Vance County—		
Corbitt Buggy Co.	Henderson	3,000 buggies.
N. C Cotton Oil Co.	do	Oil, cotton-seed meal, etc.
Henderson Ice and Cold Storage Co.	do	15 tons ice per day.
Henderson Cotton Gin	do	
Wake County—		
Farina Roller Mills	Raleigh	
State's Prison Brick Yard	do	
Caraleigh Phos. and Fert. Works	do	16,000,000 tons.

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Wake County—continued.		
J. H. Gill Foundry	Raleigh	$25,000.
Raleigh Iron Works	do	
Carolina Ice Co.	do	
Raleigh Ice and Electric Co.	do	
N. C. Building and Supply Co.	do	
Raleigh Mfg. Co.	do	
Raleigh Mfg. and Supply Co.	do	
Mills Mfg. Co.	do	
Carolina Wood-workers	do	
W. H. King Drug Co.	do	
Bobbitt-Wynne Drug Co.	do	Rheumacide.
Henry T. Hicks Drug Co.	do	Capudine.
Jas. I. Johnson Drug Co.	do	Anticephalalgine.
Shaw Ridge Land and Improvement Co.	do	
Standard Gas and Electric Co.	do	
N. C. Cotton Oil Co.	do	Fertilizers.
Zachary Mantel Co.	do	
W. A. King Saw and Planing Mill	do	
W. H. Worth & Co.	do	Fertilizers.
Farmers Guano Co.	do	Fertilizers.
W. B. Dunn Plow Co.	Wake Forest	
Wake Forest Canning Co.	do	
Harrison Wagon Co.	Cary	
Apex Canning Co.	Apex	3,000 cases tomatoes.
Wakefield Mercantile and Mfg. Co.	Wakefield	
K. B. Johnson Saw and Planing Mill	Cardenas	1,500,000 feet.
Dr. J. A. Sexton Saw and Planing Mill	Fuquay Springs	
G. B. Alford Saw and Planing Mill	Holly Springs	
Varina Lumber Co.	Varina	
J. J. Jordan Lumber Co.	Gulley's Mill	
A. J. Blalock Lumber Co.	do	
S. C. Hobby Lumber Co.	McCullers	
T. H. Turner Lumber Co.	Gulley's Mill	
P. W. Dowd Lumber Co.	Auburn	
C. F. Ferrell Lumber Co.	Morrisville	
Duke Bros. Lumber Co.	do	
J. J. Edwards Lumber Co.	Holly Springs	
C. J. Lassiter Lumber Co.	Six Forks	
E. O. Penny Lumber Co.	Falls	
Geo. B. Norwood Lumber Co.	Raleigh, R. F. D. 1	
Wm. Adams Lumber Co.	Vanteen	
Warren County—		
Warrenton Roller Mills	Warrenton	
Warrenton Furniture Co.	do	90,000 chairs.
J. M. Ramsour & Sons Carriage Factory	do	
W. E. Davis Wagon Co.	do	
Bridle Creek Stock Farm	do	
W. A. Overby's Canning Factory	Macon	500 cases tomatoes and beans.
W. H. Pridgen Apiary	Creek	
R. H. Southerland Box Factory	Vicksboro	
Washington County—		
John L. Roper Lumber Co.	Roper	15,000,000 ft. lumber and 15,000,000 shingles.
Walker & Myers	Plymouth	Lumber, shingles and laths.
Witt's Veneering Co.	do	
Plymouth Milling Co.	do	
J. M. Reed & Son	do	
H. Peal Buggy Co.	do	
Jackson & Jackson	Hoke	
T. J. Basnight	Scuppernong	
W. F. Phelp's Mill	Cherry	
A. Alexander	Creswell	
Watauga County—		
Mast & Bingham Roller Mill	Sugar Grove	
John W. Dyer	St. Jude	Vehicles.
Triplett Locust Pin Factory	Triplett	1,440,000 pins.
Call & Smith Locust Pin Factory	Stony Fork	1,560,000 pins.
Carinder & Sons' Saw-mill	Matney	
W. C. Ward Saw-mill	Watauga Falls	
W. S. Rominger Saw-mill	do	
Yates & Oliver	do	Lumber.
G. F. Bingham & Bro. Pin Factory	Mabel	
W. V. Caloway Saw-mill	Shull's Mills	
Green & Co. Saw-mill	Sweetwater	
S. H. Banner Saw-mill	Banner's Elk	
C. D. Taylor Saw-mill	Valle Cruces	
Henson & Son's Saw-mill	Amantha	
Bingham & Shell Pin Factory	Meat Camp	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Wayne County—		
H. Weil & Bro.'s Brick Yard	Goldsboro	4,000,000 brick.
Goldsboro Ice Co.	do	10 tons daily.
Carolina Rice Mills	do	3,750,000 pounds cleaned.
Goldsboro Brick Works	do	5,500,000 brick.
Park Heights Land Co.	do	Building lots for sale.
The Goldsboro Buggy Co.	do	1,500 jobs.
Wayne Brick Works	do	2,500,000 common brick.
A. T. Griffin's Mills	do	100,000 feet lumber and 200,000 shingles.
Goldsboro Shoe Co.	do	Shoe dealers.
Enterprise Lumber Co	do	9,390,000 feet.
Wayne Agricultural Works	do	
Griffin's Brick Yard	do	3,000,000 brick.
Goldsboro Furniture Co.	do	
Southern Cotton Oil Co.	do	
Best & Thompson	do	Fertilizers.
H. Weil & Bros.	do	Fertilizers.
Dewey Bros. Machine Shops	do	
Royall & Borden Felt Mattress Factory	do	
Bell Lumber Co.	Mt. Olive	
Fremont Oil Co.	Fremont	2,000 tons meal.
Wilkes County—		
R. A. Spainhour & Co.	Wilkesboro	$3,000.
Forest Furniture Co.	North Wilkesb'o	$45,000.
Church Lumber Co.	Roaring River	8,000 feet per day.
The W. M. Absher Co.	Wilkesboro	2,500,000 arms, 2,000,000 pins, 2,000,000 brackets.
C. C. Smoot & Son's Co.	North Wilkesb'o	50,000 tanned hides.
W. C. Meadows & Sons	Poor's Knob	$3,000.
Oak Furniture Co.	North Wilkesb'o	1,250 cases per month.
W. C. Winkler & Co.	Wilkesboro	1,000,000 insulator pins and 500,000 B. spools.
North Wilkesboro Iron Works	North Wilkesb'o	$1,200.
J. L. Turner Coffin Co.	do	4,080 coffins.
Call & Combs	Wilkesboro	Locust pins.
J. L. Webster	do	Vehicles.
J. V. Wallace Foundry	North Wilkesb'o	$1,800.
Hackett Bros. Flour Mill	do	
Moravian Falls Mfg. Co.	Moravian Falls	
Roaring River Mfg. Co.	Roaring River	
Quarry Milling Co.	Quarry	
Stanton Tanning Co.	Stanton	
Wilson County—		
Hackney Wagon Co.	Wilson	3,000 wagons and carts.
Hackney Bros.	do	4,000 buggies.
John L. Bailey Brick Co.	do	500,000 brick.
Hargrave Chemical Co.	do	Recently began business.
Dr. Worthington Southern Mfg. Co.	do	100 gross cholera cure.
Wilson Ice and Refrigerating Co.	do	15 tons ice per day.
Farmers Cotton Oil Co.	do	2,000 tons.
Silas Lucas Brick Mills	do	5,000,000 brick.
Carolina Brights Cigarette Co.	do	Cigarettes.
Briggs & Simms	do	Sash, doors and blinds.
W. T. Hewlett Harness Co.	do	
G. H. Wainwright Plow Factory	do	
Wilson Oil Co.	Wilson	Cotton-seed meal.
Elm City Improvement Co.	Elm City	
Dennis Simmons Lumber Co.	do	15,650,000 feet.
Tilgham Lumber Co.	do	
Jno. L. Bailey & Co.	do	Fertilizers.
Lucama Lumber Co.	Lucama	
Yadkin County—		
Boonville Milling Co.	Boonville	30 bbls. flour and 200 bus. corn per day.
M. L. Woodhouse & Bro.	do	$8,000.
J. C. Money Furniture Co.	Yadkinville	Furniture.
Tobacco Factory No. 113, 5th District	Poindexter	10,000 lbs. tobacco.
S. L. Mackie Mfg. Co.	Yadkinville	Manufacturer of leather and harness.
Yadkin Valley Canning Co.	East Bend	200 doz. No. 3 standard cans.
John A. Martin's Mills	do	150,000 feet lumber.
J. M. Speer Tobacco Factory	Boonville	
Morse & Wade Smoking Tobacco Factory	East Bend	
Morse & Wade Smoking Tobacco Sack Fac.	do	
T. A. Smitherman Carriage and Buggy Factory	do	
J. G. Gulf Carriage and Buggy Factory	do	

MISCELLANEOUS MILLS—CONTINUED.

Name of Mill.	Post-office.	Annual Output.
Yadkin County—continued.		
J. T. Patterson Carriage and Buggy Fac.	East Bend	
N. C. Hardwood Co.	Yadkinville	
S. W. & C. G. Vestal Roller Mills	do	
Yadkinville Roller Mills	do	
E. J. West Buggy & Wagon Shops	do	
J. H. James Furniture and Coffin Co.	do	
C. F. Dunnagan Tobacco Factory	do	
J. E. Zachary Tobacco Factory	do	
I. M. Hinshaw Lumber Mill	do	
J. R. Reece & Sons Lumber Mill	do	
Carolina Hardwood Co.	do	
B. & I. Shore Roller Mill	Grant	
Yadkin Valley Distillery Co.	Shore	
Yadkin Valley Roller Mill	do	
G. L. Matthews Tobacco Factory	Poindexter	
L. P. Matthews & Sons Lumber Co.	Richmond Hill	
Old Nick Whiskey Co.	Panther Creek	
Frank Pardue Furniture Factory	Jonesville	
Lee Seagrove Axe Handle Factory	Hamptonville	
Luther Miller Tannery	Footville	
Yancey County—		
Green Mountain Roller Mills	Green Mountain	15,650 barrels flour.
Adkins Saw Mill	Sioux	
Cane River Roller Mills Co.	Cane River	
Hetta-Ida Milling Co.	do	
Brawley & Smith Saw-mill	Huntsdale	
Bald Creek Mills	Bald Creek	
Bald Mountain Lumber Co.	Hensley	
Walter H. Harman Saw-mill	Higgins	
Robertson & Peterson Saw-mill Co.	Green Mountain	
National Graphite Co.	Micaville	
Robertson Bros. Planing and Grist-mills	Burnsville	

CATTLE REGISTER.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Alamance County—				
J. F. Homewood	Burlington	Ayrshire	2	3
John Baker	Haw River	Jersey		4
Hugh Dixon	do	Jersey		3
R. W. Scott	Melville	Jersey	15	10
L. B. Holt	Graham	B. Pole Angus	1	
Do	do	Devon	15	6
Alexander County—				
R. C. Allen	Hiddenite	Jersey		
J. N. Smith	Taylorsville	Jersey		
J. L. Bowman	Bently	Jersey	6	4
Alleghany County—				
Eugene Transon	Stratford	Short-horn	1	
Do	do	Devon		6
B. L. Edwards	do	Short-horn		4
Bob Crouse	Delphia	do	1	
Jane Gambill	do	do	1	
Alex. Woodruff	Cherry Lane	do	1	
F. P. Fields	Elk Creek	do		6
J. Wagoner	Eunice	Herefords		
Clark Higgins	do	Short-horn	1	15
N. C. Shepherd	Scottville	do	1	15
B. Moxley	Sparta	do		1
Ashe County—				
John Dent	Jefferson	Durham		10
Jas. P. Perkins	Helton	Short-horn	8	
W. C. Greer	Grassy Creek	do	10	
W. H. Perkins	Lansing	do		50
W. H. Worth	Creston	Hereford		1
W. A. Miller	Othello	Short-horn		3
T. K. Miller	Ore Knob	do		11
W. P. Hamilton	Beaver Creek	do	2	

CATTLE REGISTER—CONTINUED.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Beaufort County—				
H. H. Brown	Aurora	Jersey		5
C. L. Broome	do	do		2
Col. R. W. Wharton	Wharton	Devon		
Burke County—				
Amos Huffman	Pearson	Jersey		2
D. T. Huffman	do	do		1
D. F. Huffman	do	do		2
State Hospital	Morganton	Holstein		
Cleveland County—				
G. F. Hambright	Kings Mountain	S. H. Durham	1	1
J. C. Osborn	Lawndale	Jersey	1	8
Clay County—				
J. D. Kitchin	Shooting Creek	Devon		
W. H. Johnson	Tusquitee	do		
Sam Allison	Hayesville	do		
W. T. Bumgarner	do	do		4
McClure & Bumgarner	do	Aberdeen-Angus	2	4
W. J. Winchester	do	Red Poll		1
Columbus County—				
J. P. Council	Wananish	Devon		10
J. L. Memory	Whiteville	Jerseys	3	
S. E. Memory	do	do		3
R. H. Powell	do	do		2
J. D. Strauss	Bolton	do	1	
Davidson County—				
Heirs of T. M. Holt	Haw River	Devon		8
Forsyth County—				
F. W. Sheetz	Winston	Guernsey	8	
A. B. Atwood	do	Jersey	25	30
Edgecombe County—				
John L. Cherry	Tarboro	do	1	5
Franklin County—				
W. L. McGhee	Franklin	do	8	15
W. G. Strickland	Katesville	do		5
Gaston County—				
R. L. Abernathy	Mount Holly	do		15
J. T. R. Dameron	Bessemer City	do		10
Granville County—				
John P. Jones	Big Rock	do	1	2
W. L. Taylor	Bullock	Red Poll		2
Webb Jenkins	do	Jersey		4
Guilford County—				
R. S. Smith	Guilford College	do	2	12
O. Conno Dairy Co.	Greensboro	Holstein	15	10
S. W. H. Smith	Guilford College	Jersey	5	10
J. F. Davis	do	do	10	10
Henry Davis	do	Poll-Angus	2	2
Halifax County—				
C. A. Williams	Ringwood	Angus		2
W. V. Bobbitt	do	Red Poll		1
Hyde County—				
John M. Mann	Middleton	Jersey		4
H. C. Carter	Fairfield	do		6
George Watson	Wysocking	do		8
Jackson County—				
Daniel Snider	Webster	Devon		10
F. H. Leatherwood	do	Jersey		5
M. Buchanan	Sylva	Holstein		4
Lincoln County—				
R. H. W. Barker	Lucia	Jersey		3
McDowell County—				
W. C. Nelbitt	Stone Mountain	Short-horn	1	
C. W. Nanney	Red Top	do		1
Macon County—				
N. L. Barnard	Franklin	Red Poll	8	3
S. L. Rogers	do	Short-horn	5	9
Geo. A. Jones	do	Devon	5	9
Do	do	do	6	2
Lee Crawford	do	Short-horn	5	2
Mrs. G. R. Patton	do	Red Poll		2
C. W. Slagle	do	Devon	7	

CATTLE REGISTER—CONTINUED.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Mecklenburg County—				
G. M. Phifer	Charlotte	Guernsey	5	7
J. E. Thompson	do	Jersey		
W. S. Pharr	do	Red Poll		
C. C. Moore	do	Holstein		
Montgomery County—				
E. J. Ingram	Mt. Gilead	Holstein	3	3
M. A. Bennett	Marcus	Jersey		2
Nash County—				
T. P. Braswell	Battleboro	do	35	40
R. H. Ricks	Rocky Mount	do		25
Person County—				
D. R. Clayton	Surl	Guernsey		5
Randolph County—				
Z. S. Moffitt	Brown	Jersey	1	
S. S. Cox	do	do		1
Rockingham County—				
P. B. Johnson	Reidsville	Guernsey		5
Jno. D. Martin	Leaksville	do	4	3
W. H. Gibbs	Reidsville	Jersey		10
T. B. Fitzgerald	Fitzgerald	Angus		18
A. L. French	Byrdville, Va.	do		38
Rutherford County—				
M. O. Dickerson	Rutherfordton	Jersey	2	1
W. A. Thompson	do	do	4	
H. E. Edwards	do	do	1	2
C. C. Reid	do	do	1	1
R. B. Clark	do	do	1	1
T. B. Twitty	do	do	1	
H. S. Towns	do	do		1
Robt. Gettys	Hollis	do	1	
Ed. Thompson	Cliffdale	do	5	
G. W. Thompson	do	do	2	
M. O. Dickerson	Rutherfordton	do	3	
W. A. Thompson	do	do	5	
Chas. Reid	do	do	2	
R. B. Clark	do	do	2	
R. L. Hampton	do	do	3	
Surry County—				
A. Chatham	Elkin	Devon		
A. G. Click	do	Jersey		3
Vance County—				
A. J. Cheek	Henderson	do		2
Wayne County—				
Z. E. Person	Pikeville	do		
D. M. Kornegay	Mt. Olive	do		2
J. S. Davis	Goldsboro	Holstein		2
W. F. Rose	do	Jersey		2
A. L. Sasser	do	do		15
John Davis	do	do		15
Wilkes County—				
L. E. Davis	Goshen	Hereford	28	28
Do	do	Jersey	6	14
Wilson County—				
J. S. Woodard, Jr.	Wilson	do		7

HORSE AND JACK REGISTER.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Alamance County—				
L. B. Holt	Graham	Standard	12	7
Do	do	Shetland Ponies	25	70
Alleghany County—				
S. A. Choate	Sparta	Spanish Jack	1	
John Choate	do	do	1	
Caldwell County—				
H. C. Coffey	Collettsville	Jacks		2

HORSE AND JACK REGISTER—CONTINUED.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Clay County—				
J. D. Kitchin	Shooting Creek	Percheron		
W. H. Johnson	Tusquitee	Mules		
J. H. Wilson	Peachtree	Black Hock		
W. H. Crawford	Clarence	Hamiltonian		1
Do	do	Spanish Jack		1
Columbus County—				
J. D. Strauss	Bolton	do		1
Davidson County—				
Heirs of T. M. Holt	Haw River	do		1
Edgecombe County—				
John L. Cherry	Tarboro	Thoroughbred	3	4
Franklin County—				
W. L. McGhee	Franklin	Hamiltonian	4	3
Gaston County—				
Capt. Robt. L. Abernathy	Standard	Standard	5	
Lincoln County—				
R. H. W. Baker	Lucia	Spanish Jacks		2
Macon County—				
N. L. Barnard	Franklin	Spanish Jacks		5
Nash County—				
T. P. Braswell	Battleboro	Hamiltonian		
Rutherford County—				
Ed. Thompson	Cliffdale	Jacks		
Rockingham County—				
H. P. Brown	Reidsville	Spanish Jack		

SHEEP AND GOAT REGISTER.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Alamance County—				
J. F. Homewood	Burlington	Shropshire		20
Alleghany County—				
Eugene Transon	Stratford	Shropshire	6	6
B. L. Edwards	do	do	2	8
Alex. Woodruff	Cherry Lane	Angora Goats	3	10
Ashe County—				
John Dent	Jefferson	Shropshire		75
Jas. P. Perkins	Helton	do	18	
W. C. Greer	Grassy Creek	do		63
T. K. Miller	Ore Knob	do		20
W. G. Thomson	Grassy Creek	do		10
Caldwell County—				
C. D. Coffey	Collettsville	Angora Goats		5
Chatham County—				
O. A. Clapp	Siler City	Shropshire		5
Clay County—				
J. D. Kitchin	Shooting Creek	Cotswold		
W. H. Johnson	Tusquitee	Southdown		
J. H. Wilson	Peachtree	do		
W. T. Bumgarner	Hayesville	do		6
D. B. Ketron	do	do		11
Davidson County—				
Heirs of T. M. Holt	Haw River	do		17
Edgecombe County—				
John L. Cherry	Tarboro	do	1	6
Granville County—				
E. W. Worth	Oxford	Angora Goats		
H. Gregory	Stovall	Southdown	1	
Guilford County—				
S. W. H. Smith	Guilford College	Shropshire		20
Henry Davis	do	do		10
Halifax County—				
W. V. Bobbitt	Ringwood	Angora Goats		12
Hyde County—				
R. H. Mann	Fairfield	Cotswold		10

SHEEP AND GOAT REGISTER—CONTINUED.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Jackson County—				
John Cogdell	Addie	Southdown		50
McDowell County—				
W. C. Nelbitt	Stone Mountain	Southdown		7
Macon County—				
Henry Slagle	Franklin	Shropshire	12	
Mitchell County—				
W. C. Burleyson	Hawk	Rambolett		20
Belleview Farm Co.	Cranberry	do	75	
Randolph County—				
A. C. Cox	Ralph	Southdown		25
Rockingham County—				
A. L. French	Byrdville, Va.	Shropshire	6	10
Surry County—				
A. Chatham	Elkin	Cotswold Sheep		
Do	do	Angora Goats		
Wilson County—				
J. S. Woodard, Jr.	Wilson	Shropshire		6

SWINE REGISTER.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Alamance County—				
J. E. Long	Graham	Berkshire	4	
J. F. Homewood	Burlington	Poland-China	2	11
Alexander County—				
R. C. Allen	Hiddenite	English Berkshire		10
J. W. Smith	Taylorsville	do		20
R. C. Lackey	Hiddenite	do		8
T. F. Murdock	York Institute	do		3
J. L. Bowman	Bently	Berkshire	2	5
Alleghany County—				
Eugene Transon	Stratford	do		8
B. L. Edwards	do	do	1	1
F. P. Fields	Elk Creek	Poland-China		15
S. A. Choate	Sparta	Berkshire	2	10
W. A. Fender	Whitehead	do		5
H. C. Edwards	City	do		1
Ashe County—				
John Dent	Jefferson	do		5
Jas. P. Perkins	Helton	Poland-China		6
W. C. Greer	Grassy Creek	do		15
T. K. Miller	Ore Knob	do		6
Bladen County—				
N. J. Perry	Southwood	Berkshire		5
Burke County—				
Amos Huffman	Pearson	do		1
D. T. Huffman	do	do		2
D. F. Huffman	do	do		
State Hospital	Morganton	do		
Chatham County—				
O. A. Clapp	Siler City	Poland-China	5	3
Clay County—				
J. D. Kitchin	Shooting Creek	Berkshire		
J. H. Wilson	Peachtree	do		
D. B. Ketron	Hayesville	do	10	
Columbus County—				
J. L. Memory	Whiteville	Poland-China		4
S. E. Memory	do	White Chester		1
J. D. Strauss	Bolton	Berkshire		4
Davidson County—				
Heirs of T. M. Holt	Haw River	Poland-China		13
Forsyth County—				
F. W. Sheetz	Winston	Duroc-Jersey		6
A. B. Atwood	do	Berkshire	25	50
Franklin County—				
W. L. McGhee	Franklin	English Berkshire	4	20

SWINE REGISTER—CONTINUED.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Gaston County—				
Capt. Robt. L. Abernathy	Mount Holly	Black Essex	30	40
J. T. R. Dameron	Bessemer City	Berkshire		5
Granville County—				
John P. Jones	Big Rock	do	2	6
Do	do	Poland-China	2	5
C. L. Lewis	Stovall	do		1
Guilford County—				
S. W. H. Smith	Guilford College	Berkshire		2
Halifax County—				
C. A. Williams	Ringwood	Poland-China		50
Do	do	Berkshire	1	6
Hyde County—				
W. D. Mann	Wysocking	Berkshire		6
Jackson County—				
John Mood	East Laporte	do		25
A. B. Allison	Webster	Poland-China		6
W. A. Henson	Beta	Red Jersey		15
Jones County—				
T. C. Whitaker	Trenton	English Berkshire		4
Lincoln County—				
R. H. W. Barker	Lucia	Victory		2
McDowell County—				
W. C. Nelbitt	Stone Mountain	English Berkshire		1
A. B. Taylor	Dysartville	Poland-China		
R. H. Cowen	do	do		
Mecklenburg County—				
J. E. Thompson	Charlotte	Berkshire		
W. S. Pharr	do	do		
C. C. Moore	do	Jersey Red		
Nevin Poultry Yards	do	Duroc-Jersey		
Mitchell County—				
W. H. Woody	Hawk	Essex		25
Belleview Farm Co.	Cranberry	Poland-China	2	
J. M. Phillips	Ingalls	do	1	5
D. T. Weatherman	do	do	1	
Montgomery County—				
E. J. Ingram	Mt. Gilead	do		15
M. A. Bennett	Marcus	Berkshire		15
Nash County—				
T. P. Braswell	Battleboro	Poland-China, Berkshire		
R. H. Ricks	Rocky Mount	Poland-China		
Person County—				
N. T. Williams	Push	do		4
G. H. Jones	Cates	do		11
Randolph County—				
Z. S. Moffitt	Brown	Berkshire		10
Robeson County—				
W. G. McLean	Maxton	do	4	23
R. W. Townsend	Raynham	Tamworth	1	
Rockingham County—				
P. B. Johnston	Reidsville	Poland-China		1
R. A. Stokes	Ruffin	English Berkshire	1	10
A. L. French	Byrdville, Va.	Berkshire	8	20
Surry County—				
A. Chatham	Elkin	do		
Union County—				
M. A. Griffin	Monroe	English Berkshire	10	23
Wayne County—				
D. M. Kornegay	Mt. Olive	Berkshire		7
J. S. Davis	Goldsboro	Poland-China	3	12
Do	do	Berkshire	4	15
John Davis	do	Poland-China		
Wilkes County—				
L. E. Davis	Goshen	Berkshire	20	40
Do	do	Poland-China	26	50
Wilson County—				
J. S. Woodard, Jr.	Wilson	Chester		8

POULTRY REGISTER.

Name of Owner.	Post-office Address.	Name of Breed.	No. Pure Bred.
Alamance County—			
M. C. Arrowood	Burlington	White Plymouth Rocks	150
McBride Holt	Graham	White Wyandottes	200
J. F. Homewood	Burlington	White Holland Turkeys	
Joseph A. Isley	do	Barred Plymouth Rocks	300
Do	do	Buff Plymouth Rocks	200
Do	do	White Plymouth Rocks	250
Do	do	White Wyandottes	205
J. M. Workman	do	do	200
Do	do	White and Silver Penciled Wyandottes.	50
J. C. McAdams	do	Barred Plymouth Rocks	200
Do	do	Black Minorcas	35
Do	do	Buff Wyandottes	20
Rev. M. C. Arrowood	do	White Plymouth Rocks	300
Dr. J. W. Lashley	do	Buff, Barred and White Plymouth Rocks and White Wyandottes	200
J. W. L. Thompson	do	Buff Plymouth Rocks	200
Do	do	Game Bantam	24
Alamance Golden Plume Poultry Co.	do	Buff Plymouth Rocks	150
Do	do	Barred Plymouth Rocks	100
Do	do	White Plymouth Rocks	100
Do	do	White Wyandottes	100
Do	do	Buff Wyandottes	50
Do	do	Silver Penciled Wyandottes	75
Do	do	Red Pyle Game Bantams	30
J. D. Payne	do	Partridge Wyandottes	300
Alleghany County—			
Eugene Transon	Stratford	Barred Plymouth Rocks	20
Do		Mammoth Bronze Turkeys	40
B. L. Edwards	do	Barred Plymouth Rocks	100
W. A. Fender	Whitehead	White Brahmas	25
Ashe County—			
John Dent	Jefferson	Plymouth Rocks	25
Jas. P. Perkins	Helton	do	
Bladen County—			
N. J. Perry	Southwood	Brahmas	15
Do	do	Barred Plymouth Rocks	75
Caldwell County—			
C. A. Coffey	Rufus	Barred Plymouth Rocks	80
M. G. Shearer	Collettsville	do	150
Cleveland County—			
J. M. Kester	Kings Mountain	White Leghorns	100
Chatham County—			
A. F. Holeman	Ascend	Barred Plymouth Rocks	20
Do	do	Buff Plymouth Rocks	12
Do	do	White Leghorns	15
Do	do	Cornish Indian Games	14
Do	do	Silver Spangled Hamburgs	6
Do	do	Black Minorcas	5
Clay County—			
J. D. Kitchin	Shooting Creek	Brown Leghorns	30
D. B. Ketron	Hayesville	White Leghorns	25
J. W. Cherry	do	Brown Leghorns	50
Columbus County—			
J. D. Strauss	Bolton	Barred Plymouth Rocks	12
E. W. Griffin	East Arcadia	do	100
Davidson County—			
Heirs of T. M. Holt	Haw River	Brown Turkeys	25
Do	do	English Ducks	10
Do	do	Plymouth Rocks	10
Forsyth County—			
A. B. Atwood	Winston	do	200
Edgecombe County—			
C. H. Jenkins	Tarboro	Buff Wyandottes	50
Do	do	Brown Leghorns	50
Do	do	White Plymouth Rocks	50
Do	do	Barred Plymouth Rocks	50
Miss Mary M. Cherry	do	White Leghorns	40
Do	do	Brown Leghorns	60
Do	do	White Wyandottes	30
Do	do	Barred Plymouth Rocks	75
Do	do	Buff Orpingtons	100

POULTRY REGISTER—CONTINUED.

Name of Owner.	Post-office Address.	Name of Breed.	No. Pure Bred.
Franklin County—			
W. L. McGhee	Franklin	Brown Leghorns	150
W. G. Strickland	Katesville	Wyandottes	100
Gaston County—			
W. L. Ormond	Bessemer City	Barred Plymouth Rocks	125
Do	do	White Plymouth Rocks	50
Do	do	Brown Leghorns	150
Do	do	White Wyandottes	50
Do	do	Buff Wyandottes	50
Do	do	Brahmas	30
R. L. Thornburg	do	Buff Plymouth Rocks	70
Capt. Robt. L. Abernathy	Mount Holly	Barred Plymouth Rocks	300
Do	do	S. L. Wyandottes	300
Do	do	S. C. Brown Leghorns	300
Do	do	P. C. Bantams	75
Do	do	B. C. Bantams	75
J. T. R. Dameron	Bessemer City	Brown Leghorns	
Granville County—			
Wade Britt	Oxford	Barred Plymouth Rocks	
Do	do	S. C. White Leghorns	
Do	do	White Wyandottes	
John P. Jones	Big Rock	Silver Laced Wyandottes	6
Do	do	White Leghorns	8
Guilford County—			
C. W. Tate	Greensboro	Barred Plymouth Rocks	600
R. S. Smith	Guilford College	S. C. Brown Leghorns	75
Do	do	Buff Orpingtons	50
O. Conno Dairy Co.	Greensboro	Barred Plymouth Rocks	30
Do	do	Buff Plymouth Rocks	20
Do	do	Partridge Cochins	30
Do	do	Buff Cochins	15
Do	do	White Leghorns	40
Do	do	Buff Leghorns	25
Do	do	Black Minorcas	35
Do	do	White Minorcas	20
Do	do	Hamburgs	75
Do	do	Brown Langshans	30
Do	do	White Langshans	25
Do	do	Ravens	25
S. W. H. Smith	Guilford College	Leghorns	25
J. F. Davis	do	Plymouth Rocks	25
McDowell County—			
W. S. Nelbitt	Stone Mountain	do	20
C. W. Nanney	Red Top	do	20
D. L. Clements	Dome	do	40
T. B. Landis	Dysartville	Brown Leghorns	150
J. A. Taylor	do	Black Minorcas	40
Macon County—			
W. A. Curtis	Franklin	White Plymouth Rocks	20
Mecklenburg County—			
G. M. Phifer	Charlotte	Barred Plymouth Rocks	30
Do	do	Brown Leghorns	25
Do	do	White Guineas	15
Do	do	White Musk-ducks	18
C. C. Moore	do	Barred Plymouth Rocks	
Nevin Poultry Yards	do	S. C. Brown Leghorns	75
Do	do	Buff Leghorns	50
Do	do	White Leghorns	50
Do	do	Houdans	30
Do	do	White Wyandottes	50
Do	do	Black Plymouth Rocks	80
Do	do	Sherwoods	50
Do	do	Black Minorcas	50
Do	do	Light Brahmas	50
Do	do	C. I. Games	25
Do	do	Pekin Ducks	25
Montgomery County—			
E. J. Ingram	Mt. Gilead	Black Plymouth Rocks	50
Person County—			
G. H. Jones	Cates	White Plymouth Rocks	20
Robeson County—			
W. G. McLean	Maxton	Plymouth Rocks	69
Stokes County—			
C. F. Lewis	Mizpah	White Wyandottes	150

POULTRY REGISTER—CONTINUED.

Name of Owner.	Post-office Address.	Name of Breed.	No. Pure Bred.
Rockingham County—			
T. F. Rankin	Reidsville	White Plymouth Rocks	80
Do	do	Wyandottes	50
Oakland Poultry Farm	Ruffin	Any kind	
A. L. French	Byrdville, Va.	Barred Plymouth Rocks	50
Rowan County—			
E. F. Eaton	Cleveland	White Wyandottes	
Surry County—			
A. Chatham	Elkin	Black Plymouth Rocks	50
Do	do	Buff Plymouth Rocks	100
Do	do	Buff Leghorns	100
L. H. Hunt	do	Pit Games	50
Vance County—			
A. J. Cheek	Henderson	Barred Plymouth Rocks	100
Wayne County—			
W. B. Fort	Pikeville	Pea Fowls	
J. S. Davis	Goldsboro	Black Plymouth Rocks	25
Wilkes County—			
L. E. Davis	Goshen	Black Plymouth Rocks	160

FARM POULTRY.

By J. S. Jeffrey.

We find on the farms of North Carolina conditions which with reasonable attention should make poultry-raising very profitable.

The average farmer has in the past, however, thought that his poultry were not worth his attention or care, and the hen has been forced to look out for herself to a very large extent.

That the farmers of our State are waking up to the importance of the poultry industry and recognizing that with better stock and better care poultry can be made a very profitable part of the farm stock is shown by the large number of inquiries for information received by the Department of Agriculture and the Agricultural Experiment Station.

Many of these inquiries call for a reply at greater length than can reasonably be given in a letter, and it is in reply to these inquiries that this bulletin is issued.

HOUSES AND YARDS.

The first consideration is the situation for the house. If possible select a situation which is high, so that there will be good drainage from the house, as nothing is more prejudicial to the health of the fowls than dampness. Light sandy soil is preferable to heavy clay, as it dries out quicker and is easier to keep clean and fresh. Ground with a southern slope is preferable, especially for winter. The house should in all cases face the south or southeast, so as to get as much sunshine as possible.

Fig. 1.—Scratching-shed House with Nine Pens.

It is not necessary in our climate to have elaborate and warmly built houses, but it is necessary that the house be built so that the fowls can be protected from cold winds and rain, and the roosting-place should be so arranged that the fowls can be kept warm enough so that their combs will not freeze, as a hen will not lay if suffering from frost bite. The house which I consider the best suited for general farm use is what is known as the scratching-shed house. This house can be in any size to suit and may be arranged in different ways. The accompanying cut (Fig. 1) shows the house in use at the Experiment Station.

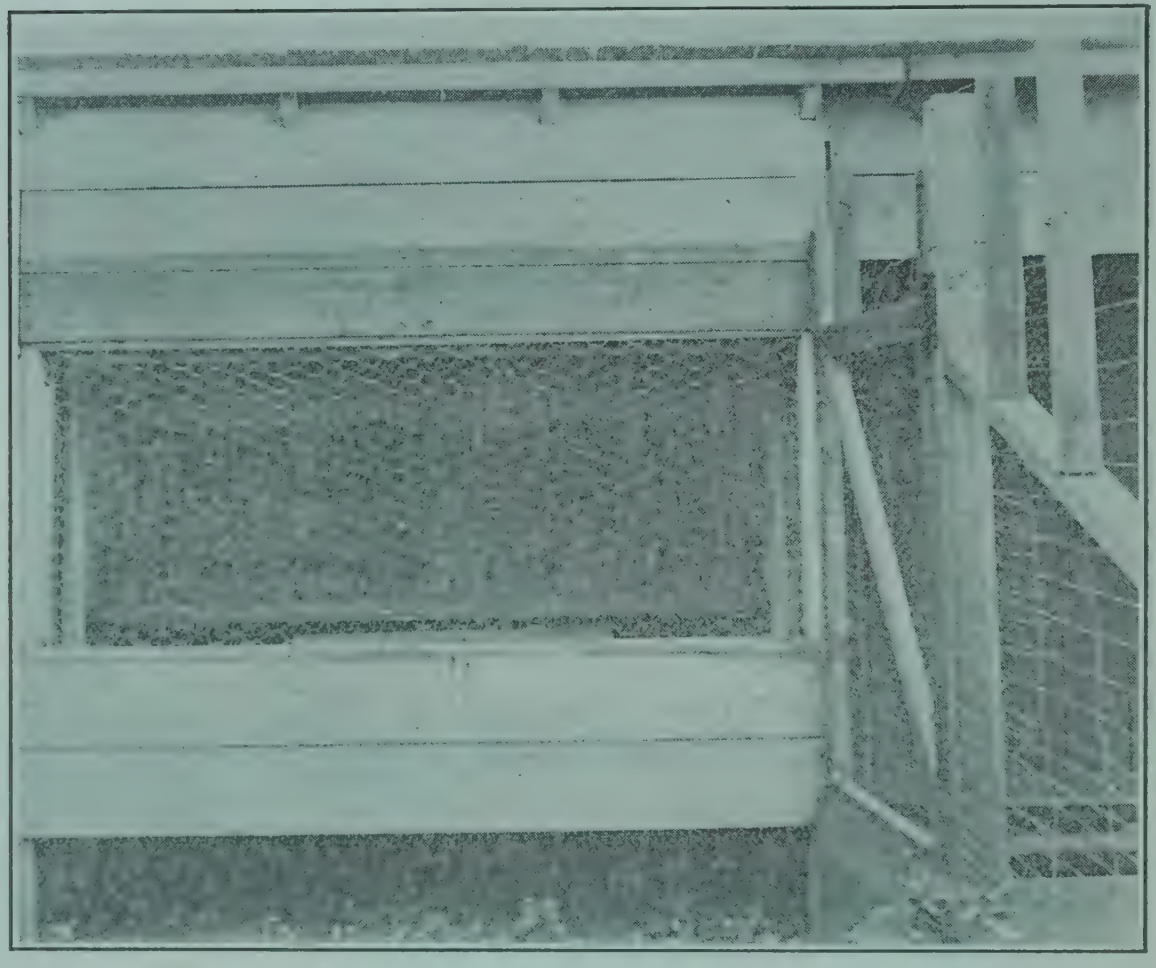


FIG. 2.—CURTAIN FRONT HOUSE WITH SCRATCHING ROOM UNDERNEATH.

Each flock has a house 10 by 18 feet, which is divided into two compartments, giving a scratching shed 10 by 10 feet, and laying and roosting room 10 by 8 feet. This house will accommodate twenty-five laying hens where eggs for market only are wanted. For eggs for hatching better results will be had where not more than twelve hens are kept in this space.

Fig. 2 shows a cheap colony house also in use at the Experiment Station. The scratching shed here is under the house, and while it is not so good a plan as the former, it has the advantage of being cheaper to build.

The house shown in Fig. 3 is one which I have not yet used, but which I think will be found well adapted to the conditions found in most parts of our State. It may also be built in any size, but the best size for the ordinary

breeding pen of twelve birds or for twenty-five hens for market eggs is ten feet by eighteen feet. The front is largely of wire netting, with a window at each end of the front to give light when the cotton curtain is closed over the wire netting in cold or stormy weather. The back ends of this house should be made tight so that fowls are not subjected to draughts. For the mountain section of the State it may be necessary to have a second curtain to close in the roosting pen. This should fit tight to the ceiling and be hinged there so that it can be hooked up out of the way in day-time. When in use it is hooked to the dropping board.

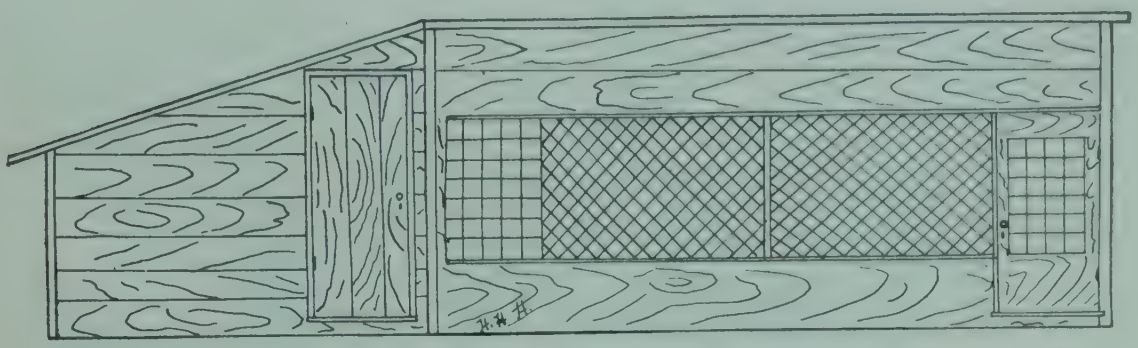


FIG. 3.—CURTAIN FRONT HOUSE.

No matter what style of house is used the interior arrangement should be such that everything can be taken out, leaving the bare walls, so that white-washing or spraying can be thoroughly done. The roosts should be on the north side or back of the house. A dropping board can be used under the roosts, and underneath the dropping board is a convenient place for the nests. Put the dropping board fifteen inches above the floor and the roosts six inches in the clear above this. The nests in use are made without either top or bottom, the ground forming the bottom and the dropping board the top. The hens pass around the ends and enter nests from the back. The front is hinged so that it can be opened to take out the eggs.

Roosts are made from 2 by 3 inch pieces set on edge, the top edges slightly rounded. They may be hung from the walls on anti-lice hangers or may be attached to a frame which rests on the dropping board in front, and is hinged to the back wall so that it can be hooked up out of the way while cleaning the dropping board.

In estimating the capacity of a house a safe rule is to allow 10 square feet for each fowl. Less room than this is very often allowed and I have even heard of fowls being successfully kept with only an allowance of two square feet of floor space each. This, however, is an extreme case, and as you reduce the space allowed you must increase the attention to cleanliness and sanitary conditions, so that it is often a question of whether labor or room is the cheapest, but in most cases it is more satisfactory to give a liberal amount of room for the fowls.

The yard room should not in any case be less than 100 square feet for each fowl, and 150 to 200 is better. Shade should be provided in the yards, and if you have no natural shade, a good plan is to plant fruit trees, as they will not only provide shade, but will bring a very welcome addition to the table in summer and the surplus will always find ready sale at profitable prices.

The fences should be made of wire netting with plank at the bottom. If you have yards adjoining, the partition fence should have two feet of plank at bottom to prevent the male birds from fighting through the wire. Never put a bar at the top of the wire, as that only makes a place for the fowls to light on, and they will fly over much easier than where there is only the wire.

If each house can have two yards, say one in front and one behind, it makes it much easier to have something green for the fowls in their yards at all times.

BREEDS OF FOWLS.

I think it is very generally conceded that pure-bred poultry is more profitable than common stock. The varieties given here are only a few of the many different varieties which are bred to-day, but I have tried to select those best adapted to every-day farm requirements.

FIG. 4.—BARRED PLYMOUTH ROCKS.

Plymouth Rocks.—I think there is no question that there will be found more Plymouth Rocks on the farms of this country than any other breed, and perhaps as many as of all other pure breeds combined. There are three varieties of this breed—the Barred, Buff and White. The general characteristics of all are the same, the only difference being in the color. The Barred is the oldest variety and the one most commonly found on farms, but the points which have made them such general favorites can be found in either of the other varieties, and the solid colored birds of lighter color have advantages from a market standpoint not possessed by the darker colored variety.

All varieties are fairly hardy, are good setters and mothers, good winter layers and fair summer layers. They lay brown shelled eggs and have the yellow legs and skin required in so many of the American markets. Standard weights are: Cock 9½ pounds, hen 7½ pounds, cockerel 8 pounds, pullet 6½ pounds.

The Wyandottes.—Here we have seven or eight varieties, and consequently more room to indulge the fancy in regard to color. The standard varieties are White, Buff, Black, Silver-laced, Golden-laced and Partridge. The Silver-penciled and Columbian varieties have not yet been admitted to the standard.

FIG. 5.—SILVER-LACED WYANDOTTES.

The Silver and Golden-laced are the oldest varieties, but the White has outstripped all the other varieties in popular favor.

The Wyandottes have the same general characteristics as the Plymouth Rocks, but are smaller and more blocky. They are quick-maturing and make first-class broilers or small or medium-sized roasters. All varieties have the rose comb.

They are good winter and fair summer layers, are good setters and mothers. Standard weights: Cock 8½, hen 6½, cockerel 7½, pullet 5½.

The Rhode Island Red is one of the American class which is kept largely by the poultry farmers of Rhode Island. They are a good general-purpose fowl. Reddish buff with black in wings and tail and black ticking in hackle. There are both single and rose-comb varieties. They do not yet breed as true to standard as some of the older breeds. This breed was admitted to the standard at the meeting in January last and their description will be in the new standard to be published this fall.

They are hardy, fair winter and summer layers, are setters, fair mothers, and are early maturers and have yellow legs and skin. Weights: Cock 7, hen 5½, cockerel 6, pullet 4½.

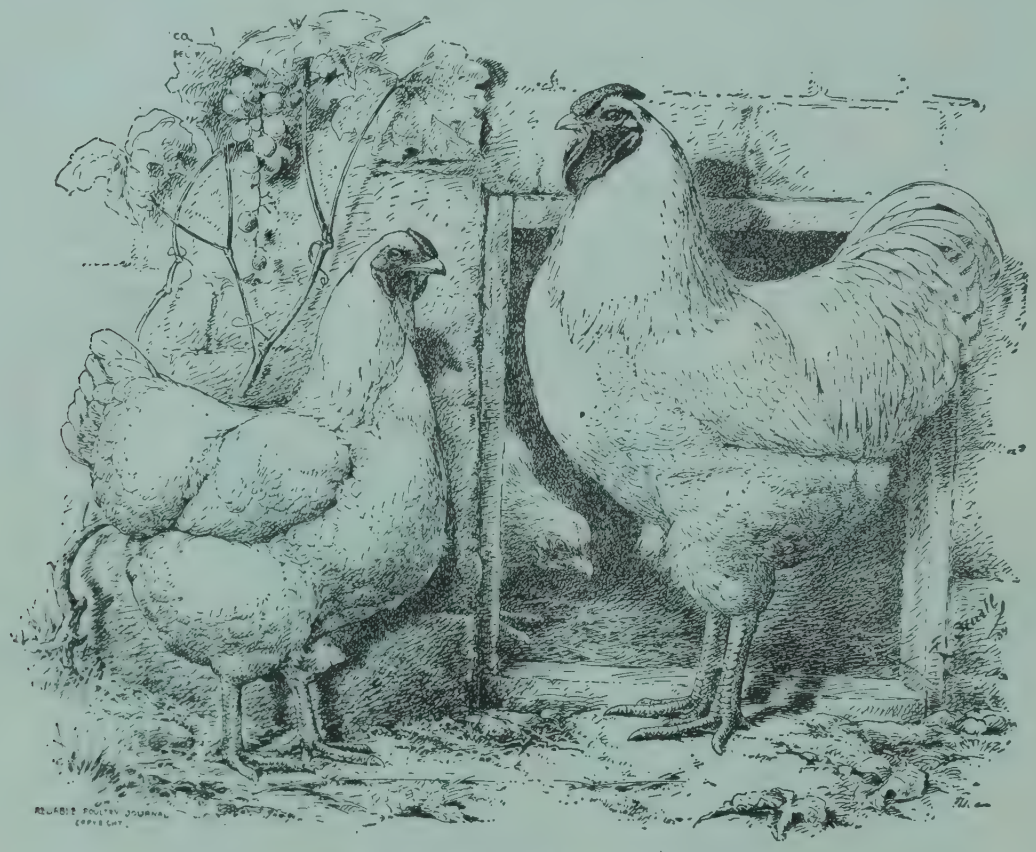


FIG. 6.—WHITE WYANDOTTES.

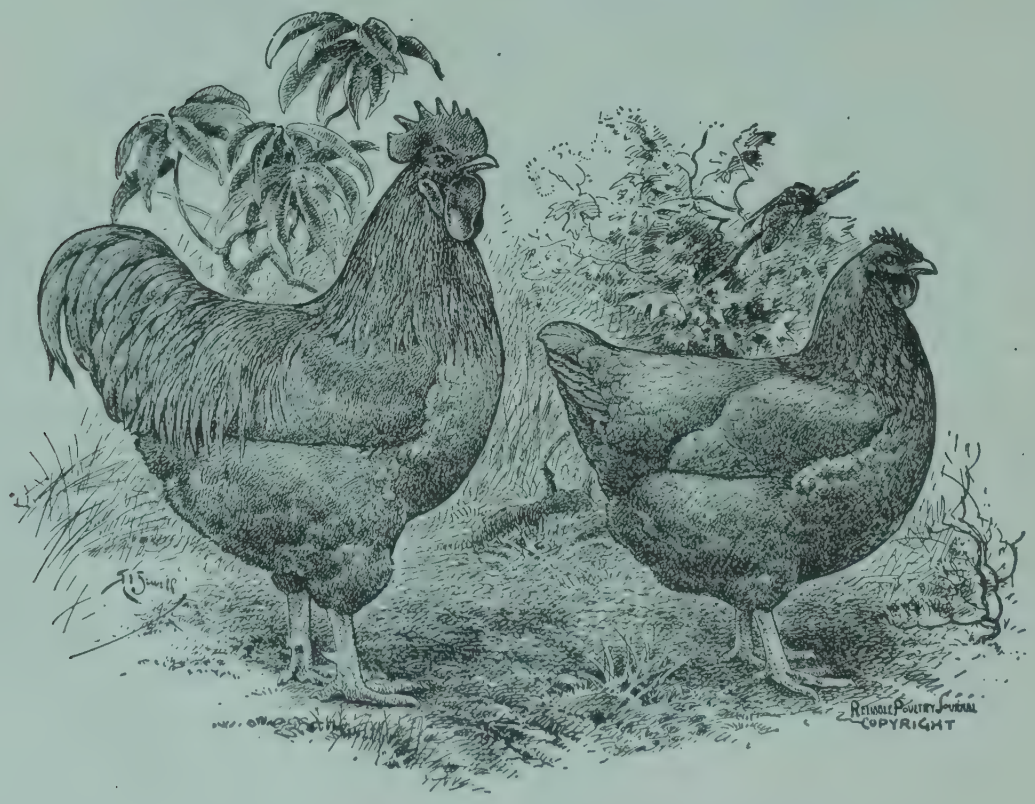


FIG. 7.—BUFF ORPINGTONS.

Orpingtons.—There are several varieties of this breed, but the Buff is the only variety admitted to the standard, and as they are by long odds the most popular I will give a description of this variety only.

They were originated in England in 1894 by William Cook & Sons and were first imported to America in 1898 and admitted to the American standard of perfection in 1902. They are the largest of what may be called the general-purpose breeds. The standard weights adopted in 1902 were: cock 10½, hen 8½, cockerel 9, pullet 7. These weights, however, were found to be too high and at the last standard revision they were reduced as follows: cock 10, hen 8, cockerel 8½, pullet 7.

They are fairly hardy, good winter and fair summer layers, setters and good mothers. Their legs and flesh are white. The quality of the flesh is good and they make good broilers and roasters, and if they can overcome the American liking for yellow legs and flesh they are likely to become one of the most popular varieties among market poultrymen.

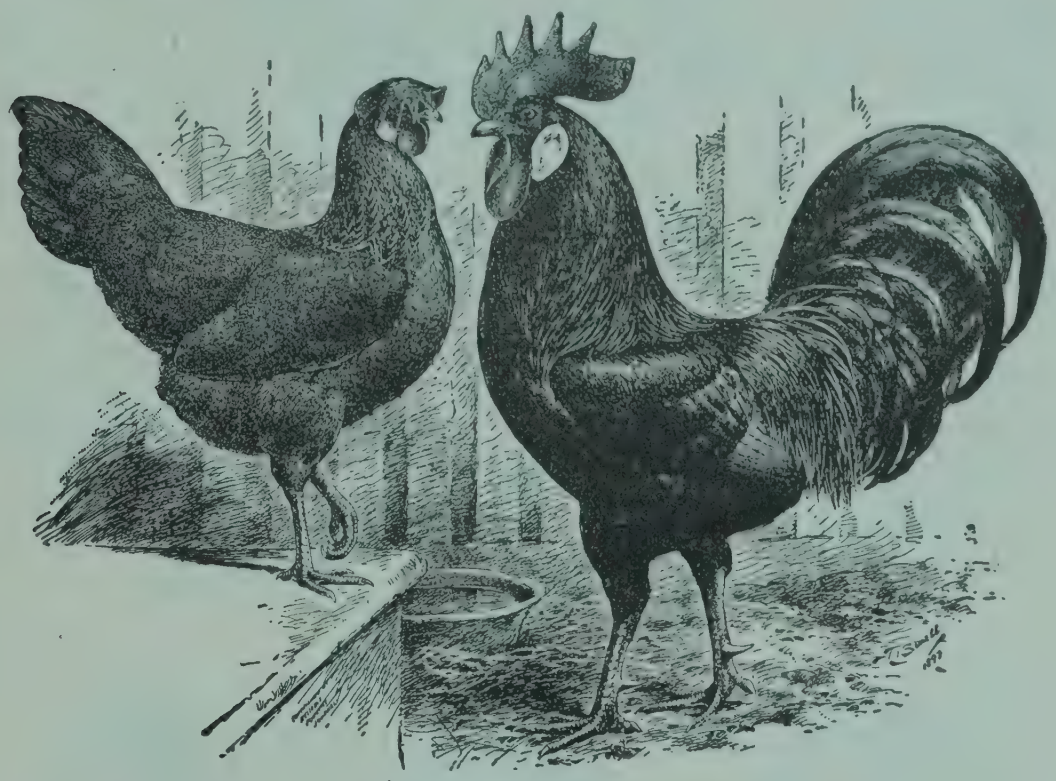


FIG. 8.—BROWN LEGHORNS.

Leghorns.—There are several varieties of this breed, but the most popular are the Single-comb, White, Brown and Buff.

Leghorns are classed among the egg breeds, and where eggs alone are required they fill the bill better perhaps than any other breed. They are non-setters, and on this account either incubators or hens of some of the setting varieties must be used for hatching.

In New York State the large egg farms which supply the New York market use the White Leghorn almost exclusively, as their fine large chalk-white eggs are what the market wants.

In this State the Brown is probably the most popular variety. The Whites lay a larger egg than the other varieties, due, no doubt, to their having been more carefully selected for this point.

FIG. 9.—WHITE LEGHORNS.

There is no standard weight on Leghorns, and they are too small to make good table birds unless it be as broilers. They feather quickly and up to three months old grow fast and on that account make fair broilers.

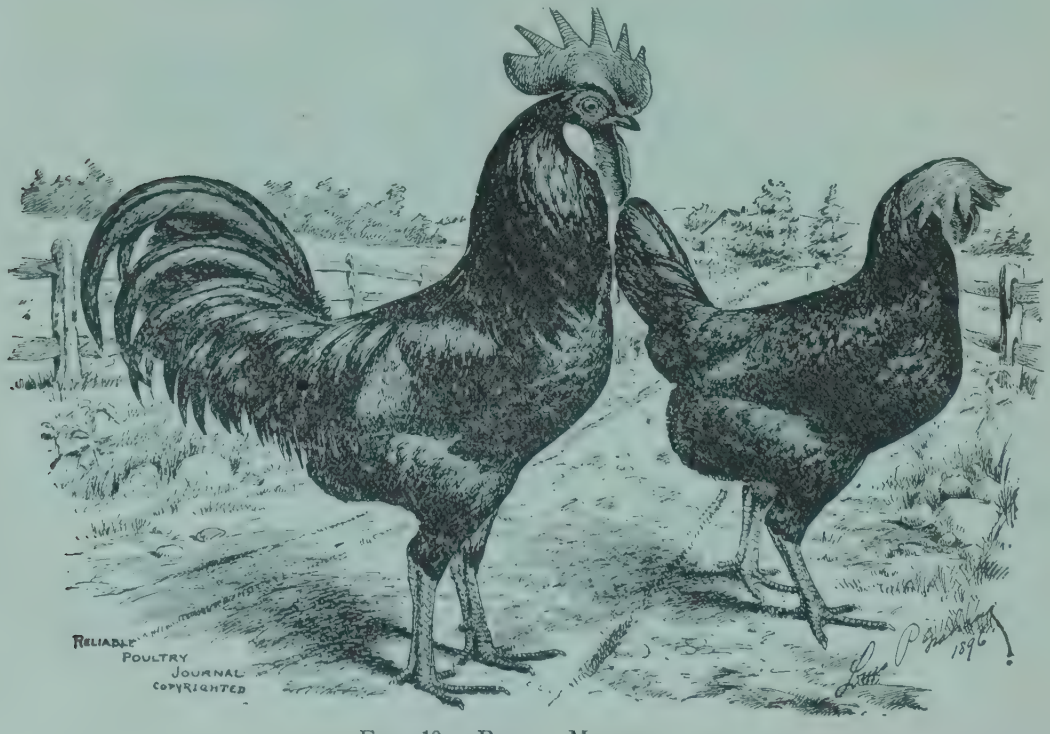


FIG. 10.—BLACK MINORCAS.

Minorcas.—There are three varieties—the Single-comb Black, Rose-comb Black and Single-comb White. The only variety, however, which is bred to any extent is the Single-comb Black.

They also belong to the egg breeds, but are larger than the Leghorns, the standard weights being: cock 8, hen 6½, cockerel 6½, pullet 5½. They are nonsetters, fairly hardy and good layers of large white eggs.

FIG. 11.—LIGHT BRAHMAS.

Among the heavier or meat breeds the only ones which I consider of any practical interest to the market poultryman are the Light Brahma and Black Langshan. The former is the largest variety of poultry. Standard weights are: cock 12, hen 9½, cockerel 10, pullet 8.

They are useful where very large roasters are in demand, but are not so well suited to our climate as the lighter clean-leg varieties. They are fairly hardy, fair winter layers, only fair as setters and mothers on account of their weight.

Black Langshans are between the Brahmas and Plymouth Rocks in size, standard weights being: cock 10, hen 7, cockerel 8, pullet 6.

They are fairly hardy, good winter layers, fair setters and mothers. They have feathered legs like the Brahma, but are more active and not so much inclined to get overfat.

Pekin Ducks may justly be called the market duck of America, as they are used almost exclusively on the large duck ranches.

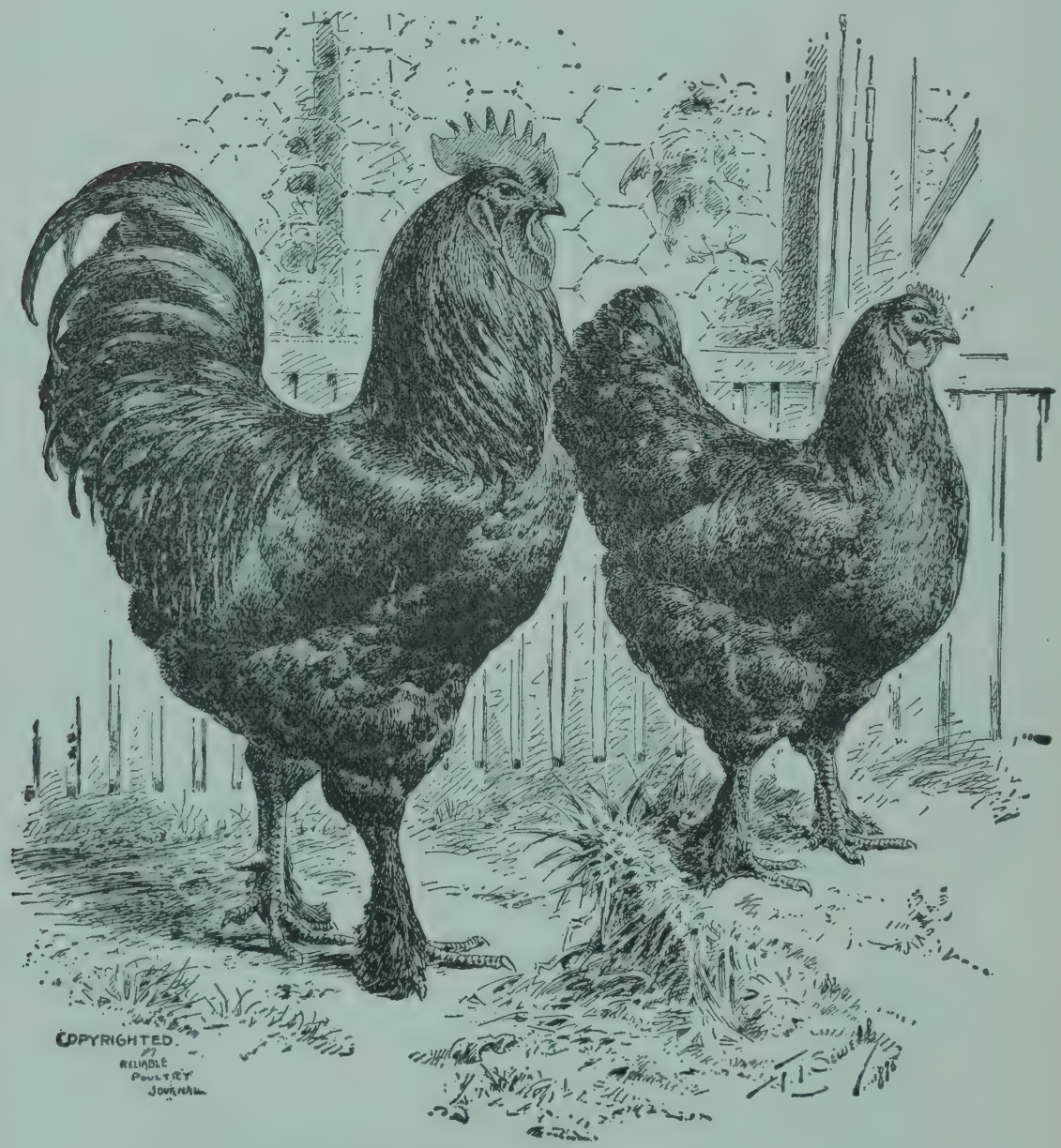


FIG. 12.—BLACK LANGSHANS.

They are hardy, mature quickly, and are fair layers. As a rule they do not become broody, and hens or an incubator are necessary for hatching.

For market purposes they should be forced from the start and marketed at ten weeks old, when they are fully feathered. They can be brought to weigh from 10 to 13 pounds per pair at this age. If kept longer they are not so profitable, as they molt about this time, and will not gain anything in weight for the next month.

For best results the breeding stock should have water to swim in, as the eggs are usually more fertile than if they have no swimming place. The young ducks will, however, grow faster and do better with no water except what they want to drink.

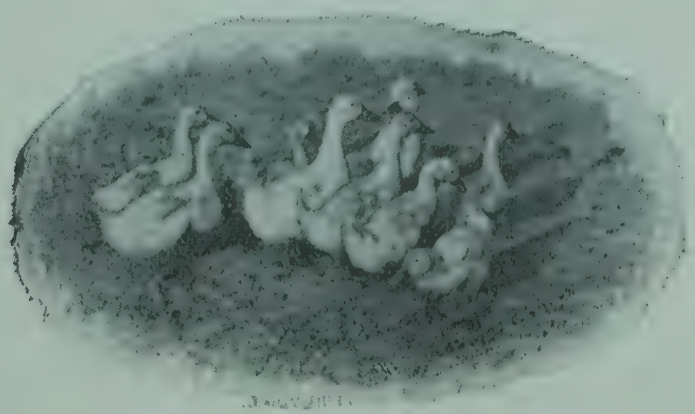


FIG. 13.—PEKIN DUCKS FIVE WEEKS OLD. THESE DUCKS AT TEN WEEKS OLD WEIGHED TWELVE POUNDS PER PAIR.

CHOOSING A BREED.

The farmer as a rule should confine his attention to one breed only. It is only in very exceptional circumstances that he will be justified in keeping more than one breed and never in keeping more than one variety of the same breed, or even two breeds of practically the same characteristics.

I find sometimes people ordering a setting each of two or three varieties and have even had orders from farmers for one setting of eggs made up of two breeds. If it is necessary in any case to keep two breeds to fill the market requirements they should each be selected for their special fitness to fill these requirements.

The farmer wants the fowl which will bring him in the greatest amount of money during the year, both in eggs and meat. It is not always the hen which lays the most eggs which pays the largest profit, as it may cost more to produce the eggs in the one case than the other, and again one variety may lay the eggs at a season of the year when they will bring the highest price, while the other may lay most of hers in the spring and early summer, when eggs are cheap.

In order to bring in the most profit the farm fowls should be fairly active, so as to be able to pick up a large part of their food, which is to be found abundantly on most farms and which would otherwise go to waste.

On the other hand, increased activity as a rule means reduced size, and we must not give too great value to the foraging qualities. I think under most circumstances the farmer will find one of the medium-sized breeds, such as the Plymouth Rocks or Wyandottes, the best suited to his needs. They are fair layers, quick maturers, make good broilers or roasters, and good setters and mothers.

SELECTION AND CARE OF BREEDING STOCK.

Do not think that when you have decided what breed you will keep your work ends there. There is as much variation, from a market standpoint, at least, in birds of the same breed as there is between different breeds. It is

more necessary to select the individual than to select the breed. It is not sufficient that the cock to head your breeding pen be a Plymouth Rock or a Wyandotte, as there are plenty of both breeds that are not what they should be. The first consideration in any breeding animal is constitution. Look for a bird with a bright, full eye, short, well-curved beak, a short, stout neck, broad back, well-rounded breast, and standing on good straight legs set well apart, and you will be almost certain to get a bird that is vigorous and strong.

Mate a male such as this with ten or twelve good females one year old that have been good layers as pullets and have always been healthy, showing no tendency to colds and roup; birds that have come through the molt quickly and in good condition, and they should produce chicks that will make a fair fight for existence. If you have not ten such hens as I describe, don't fill up the pen with inferior ones, but make the pen smaller. It is better to raise fewer and better. No matter how much room you have you have no room for sickly, puny chickens. Do not make the mistake so commonly made on farms of breeding from all the hens—good, bad and indifferent—but select only the best to breed from if it be only half a dozen hens. You will make more progress in this way in one year than you would in the hit or miss method in six.

Both male and female should, if they have been properly cared for, be at their best for breeding purposes in their second year, but well-developed young fowls in good condition will make better breeders than older ones not in good condition.

The usual number of females to a male of the American class is eight to twelve. A great deal, however, depends on the individual male bird, as some will give good results with twenty or twenty-five hens where another bird will not give fertile eggs with twelve.

If it is necessary to use more hens than one male can attend to and only one yard is available, a good plan is to use the males on alternate days. The hens intended for breeders should not be forced for laying during the winter; many breeders indeed try to keep them from laying till eggs are wanted for hatching. Constant laying tells on the vitality of the hen, and eggs laid near the end of the laying period will not as a rule hatch as well or give as strong, vigorous chicks as will the eggs first laid.

If the breeding stock cannot be given free range it will be necessary to supply green food and animal food in some form, also to give the fowls exercise. The easiest and best way to give exercise is to feed part of the ration in litter, such as straw or leaves, and let them scratch it out. The food need not be different to that fed to the laying stock, except in case the layers are fed stimulants of any kind they are better omitted from the ration for the breeders.

Birds used for breeding purposes should have more room than laying stock. Not less than ten square feet of house room should be allowed for each bird.

If the male or any of the hens show signs of sickness at any time remove them from the pen at once, as the other fowls will worry them. Kept by themselves these will usually recover rapidly, while if left in the pen they do not have as good a chance and there is danger of infection spreading to the rest of the flock.

FEEDS AND FEEDING.

What is best to feed must depend largely on market conditions. The price of the different grains varying greatly from one season to another, what may be an economic feed this season may be an expensive one next year.

Before taking up the different feeds, let us look for a moment at the hen under conditions which are found on most farms.

We find that it is in the spring that the hen naturally starts to lay. When the grass starts to grow and the worms and bugs are to be found the hen is not long in finding these delicacies and quickly turns them into eggs. Now is it not possible for us to feed through the winter so that we can to a certain extent supply the food conditions of the spring-time?

The poultrymen who are making a success at their business are studying this problem and are as far as possible giving their stock the food in winter which they can find for themselves in spring and summer. This is what is making a large part of the difference in egg production between the seven or eight dozen eggs produced by the hens on the North Carolina farms and the twelve to fifteen dozen produced on some of our best poultry farms to-day.

Corn is without doubt the most largely used of all the grains for poultry. Perhaps I would not be far wrong if I said that there is as much corn fed to poultry as all other grains combined. It is cheap and can be easily got in most localities. It is not, however, by itself a good food for poultry, being too heating and fattening. It can, however, be made the base or corner-stone of our ration. Fowls on free range, where they can get a plentiful supply of green food as well as animal food in the shape of bugs and worms, will do very well on corn.

The great trouble in feeding it to fowls in confinement is that on account of its large size the fowls get enough to satisfy their needs with very little work and the extra supply of fat is stored up to the injury of the fowl. By cracking the corn and feeding it in litter this trouble can be very largely got rid of.

Wheat is generally considered the best one grain for poultry, and is well liked by them. The large demand for wheat for human food, however, often forces the price so high that it cannot be economically fed to poultry.

Very often the small grains and screenings can be had from the flour mills at a reasonable price and make good feed.

Oats.—The feeding value of oats is nearly the same as wheat, but on account of their coarse, indigestible hull they are not so well liked by the fowls and are therefore not so suitable to feed whole. Ground or crushed they make a good addition to corn meal and bran in the mash.

Cowpeas are rich in nitrogenous matter and make a good combination with corn. On account of their large size they are better to be cracked before feeding.

Green Feed of some kind should be supplied to all fowls kept in confinement. This may be had by sowing rye or rape in the yards if the fowls can be kept off it long enough to give the crop a good start. Mangels or turnips can be grown and kept in pits and fed through the winter. It is not necessary to do more than split them and the fowls will pick them clean.

Fine-cut clover or alfalfa soaked in water for several hours and mixed in the mash will take the place of other green food and has the advantage of being easily kept.

Animal Food in some form should also be supplied. This may be had in some of the commercial foods, such as beef scrap, meat, meal or digester tankage, which are put up by the packing houses and can be had from any dealer in poultry supplies. If you can get fresh green bones it would pay to buy a bone-cutter and cut the bones and feed them. With a flock of from 50 to 100 hens, a bone-cutter will soon pay for itself in the increased number of eggs obtained.

Skim Milk is also an excellent food, either for young chicks or laying hens. In summer, at any rate, it will take the place of the other forms of animal food.

Last summer an addition of skim milk to the ration for laying hens which had not had any animal food for some time gave an increase of sixty per cent in the egg yield inside of two weeks. In this case the mash was mixed with milk instead of water and both milk and water kept before them all the time.

Grit and Oyster Shell.—It is very seldom that hens which are yarded can find enough grit and shell material unless it is supplied to them in some form. The latter may be given in the form of crushed oyster shell, or if you have it a heap of old plaster thrown where the hens can get at it will answer the purpose.

It is the almost universal custom among poultrymen to feed part of the ration in the form of grain, either whole or cracked, and the balance in the shape of a mash.

The mash we have used with good success at the Experiment Station the past winter was made as follows: corn meal, two parts; wheat bran, two parts; fine-cut clover hay, two parts; beef scrap, one part. Part of the time two parts of ground oats were also added.

Last year we used considerable quantities of cowpeas, both cracked and ground fine for the mash. This year the price has been so high that we have not fed any.

A great many feed the mash in the morning and grain at night. I reverse this plan. All our grain is fed in from four to six inches of straw and the fowls have to scratch it out; this keeps them busy most of the day. I allow them all the small grain they will scratch for and feed the mash last thing at night. I formerly fed the mash in the morning, but found if I fed all they would eat the hens would fill up on it and then mope in a corner till feeding time came round again. I think that my present plan keeps them in better condition.

INCUBATION.

On the large majority of farms the chicks are still hatched by hens, and where you do not want to hatch many, say up to 200, and are satisfied to wait till your hens are ready to set, this method is as good as any. If, however, you want to hatch more than 200 chicks, and especially if you wish to take advantage of the higher prices for early-hatched stock, the incubator will be found, if not a necessity, at least a great help. If you are depending on hens it will be necessary to select one of the general-purpose breeds, as while you will sometimes find a Leghorn or Minorca that will set, this is the exception, and they cannot be depended on.

The hen should be moved after dark to a quiet place where she will not be disturbed by other hens. Do not use a deep box, so that the hen is obliged to jump down on the eggs in returning to the nest. Take a box about twelve

inches square and six inches deep, put some earth in the bottom, taking care to see that the corners are well filled up. On top of this make the nest with fine straw or chaff.

The hen should be well dusted with insect powder or tobacco dust when first set and again a few days before the hatch is due. Feed and water should always be within reach, and if many hens are set in the same room it is safer to remove the hens each morning and see that they get back on the right nests after feeding, otherwise you may find that two hens have taken a fancy to the same nest and let a batch of eggs get chilled.

Do not bother the hen while the eggs are hatching and do not be in a hurry to feed the young chicks. They need warmth and quiet the first two days more than food.

If you decide to try an incubator do not try to find the cheapest, or rather the lowest priced one, but buy the best you can get, as it will be the cheapest in the end.

The incubator should be placed in a room where the temperature will be as even as possible and where proper ventilation can be had without having a draught on the machine.

If you are operating on a larger scale, using five or six machines, it will pay to have a regular room built for the incubators. For this purpose a room partly below and partly above the ground is the most satisfactory, as

Fig. 14.—A Corner of Incubator Cellar at Experiment Station.

the temperature will be more even. If a good dry cellar that can be well ventilated is available it will be as good a place as can be found, but it must be dry and sweet. A musty, damp cellar will not answer, in fact you may say that no place which is not fit for a person to live in is fit to run an incubator in.

Set your incubator up and run it for a few days to make sure that it will hold the temperature and the regulator is working properly. When you are satisfied that the machine is working properly put your eggs in and follow the directions sent out by the maker.

There are so many different kinds of incubators that it is impossible to give a set of rules for operating which will give the best results with all of them, and it is best to follow closely the directions sent out with the machine.

Do not open the machine after the eggs begin to chip until the hatch is well over. A chick that cannot break the shell is not worth saving, as he is not likely to have strength enough to make a successful fight for existence.

REARING THE CHICKS.

I think I may say that almost without exception chicks hatched by hens are reared by them, but it does not follow that chicks hatched in an incubator must be raised in a brooder. If you have the hens broody by the time the

FIG. 15.—EXTERIOR OF BROODER HOUSE WITH INCUBATOR CELLAR AND OFFICE ADJOINING.

chicks are hatched there is very seldom any trouble getting them to take the young chicks and raise them. The safest way is to put a few eggs from the incubator under the hen a day or two before they are due and let her hatch them, then she can be given extra chicks from the incubator without trouble, especially if it is done after dark. The number given must depend on the hen and the time of year. Early in the season fifteen or, at most, twenty, may be given, while when the weather is warm more may safely be given. I had a Wyandotte hen look after forty-two chicks hatched about the middle of June this year.

If brooders are used, unless a warm house is provided, I prefer the three-compartment outdoor brooder. This brooder, with a cheap shelter house to protect it from the most severe weather and high wind, can be successfully used all through the winter.

The floor of the brooder should be covered with fine sand or clover chaff and heated to ninety degrees before the chicks are put in. The heat from the chicks will probably raise the temperature to ninety-five degrees, and for the first week it should be kept between ninety and ninety-five degrees, gradually reducing the temperature after this till the chicks are feathered and able to do without any heat. Never feed the chicks till they are from 36 to 48 hours old. Early feeding causes indigestion and bowel trouble. Water should be kept before the chicks at all times and should in cold weather have the chill taken off. Care should be taken to see that the water is kept fresh and the water-dish clean. I think as much depends on how you feed as what you feed. I have had good success feeding a dry grain chick food from the first, adding beef scraps after the first week, and have also raised fine chicks that

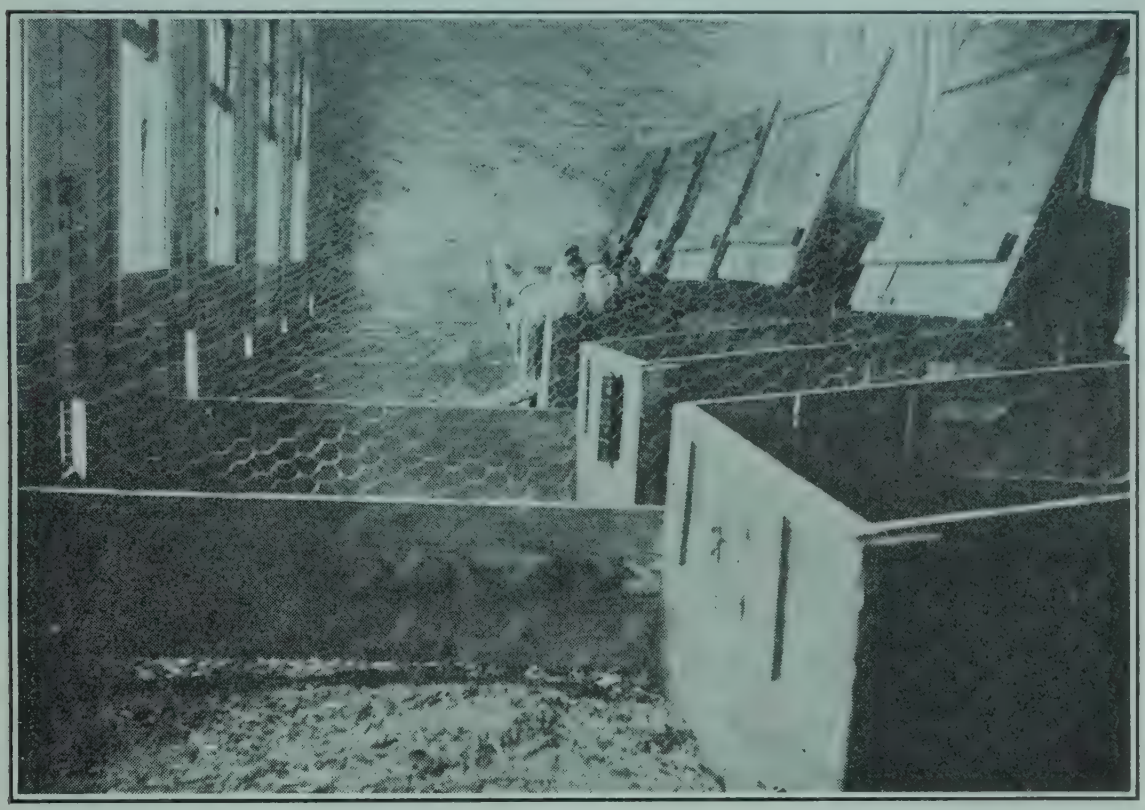


FIG. 16.—INTERIOR VIEW OF BROODER HOUSE WITH THREE-COMPARTMENT BROODERS IN USE.

were fed considerable mash food. I think the secret of success is in feeding a little at a time and giving it often. Always keep the chicks a little hungry and ready for their food.

One of the advantages in the dry chick food is that by feeding it in litter the chicks are induced to take exercise, which is necessary. This of course applies more to brooder-raised than hen-raised chicks, as hen-raised chicks, where the hen is not confined, are sometimes exercised to death.

What you are raising the chicks for will determine largely their treatment and food after the first two or three weeks.

If broilers or fryers are your object, you must to get the best returns market in from ten to twelve weeks, and it is a case of short life and a merry one, and the chick must be induced to eat all the food he can and still

keep him on his feet. If you wish to produce a fine roasting chicken of five or six pounds weight, the forcing should not start so soon, but the chick may have more exercise and be fed to make frame for the first three or three and a half months, and then four or five weeks in the fattening crate or small pen should finish him and put him on the market in prime condition.

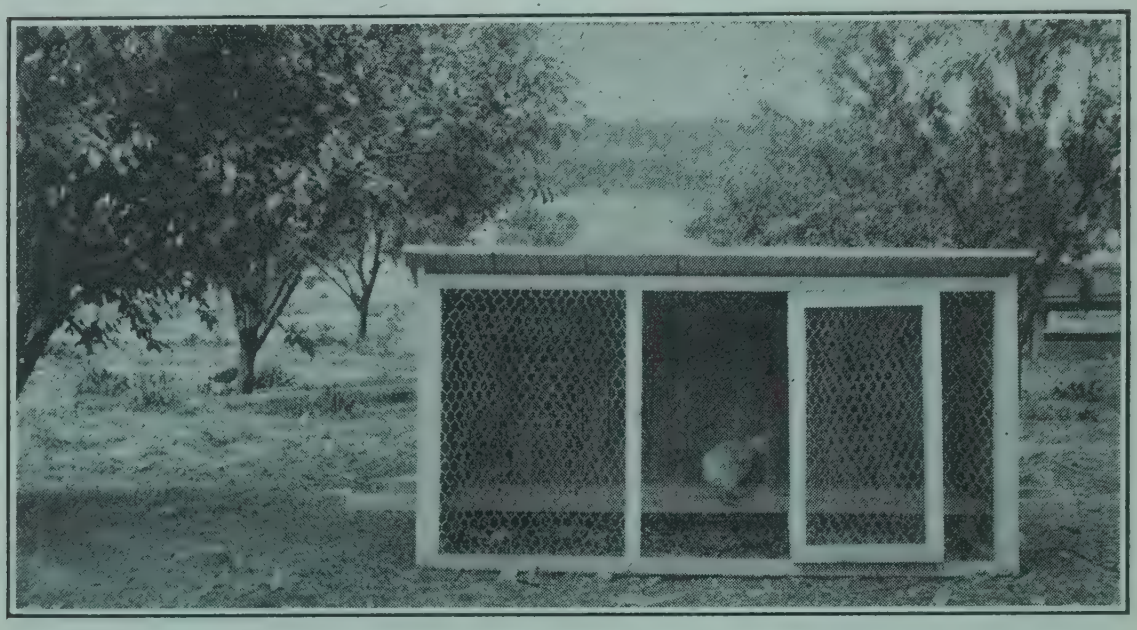


FIG. 17.—ROOSTING COOP FOR WEANED CHICKS TILL THEY GO INTO WINTER QUARTERS.

Breeding stock should have more range and consequently more exercise and opportunity to build up a good constitution than is necessary in either of the former cases. On this constitution will depend all your hopes of future success, as the bird that is lacking in this particular will never make a profitable breeder and give you chicks that will be strong and ready to make a good fight for existence.

MARKETING POULTRY AND EGGS.

I do not think there is any farm product which will give a greater return for the time and skill necessary to put it on the market in prime condition than poultry and eggs. When we find chicks selling from 12 to 18 cents per pound and eggs at from 14 to 22 cents per dozen, and this difference solely on account of the quality, surely it will pay us to put our products on the market in the best possible condition.

The first necessity, of course, is the proper kind of stock. We have discussed this and will now take up the question of feeding, from where we left the chicken at three and a half months old in the preceding chapter.

The chicken up to this time has had plenty of exercise, but this must now stop. While it is necessary to make him strong and healthy, it is not the best way to make tender, juicy meat. The chicken should either be confined in the fattening crate or in a small pen. The less he moves around the better.

The whole grain should be left out of the ration and soft feed given entirely from the time he goes into the coop till he is ready for market. A good ration is made up as follows: corn meal, 5 parts; shorts, 4 parts; animal meal, 1

part. If skim milk is available, mix the food with it instead of water and make it much wetter than you would the mash for laying hens. Feed twice a day, feeding lightly for the first few days, and then all they will eat up clean twice a day.

Four weeks of this feeding should put them in first-class condition, adding about two pounds each. Experiments have shown that this extra two pounds can be put on at a cost of from five to six cents per pound, so that even if the extra quality did not raise the price of the three and a half pounds you started with, the feeding would pay well.

FIG. 18.—FATTENING COOP FOR FINISHING CHICKENS, HOLDING FROM 12 TO 15 CHICKENS.

Before killing, the birds should be starved for from 24 to 36 hours to have the crop and intestines clear of food, which if left there would decompose and spoil the flavor of the fowl. Killing is best done by bleeding in the mouth. Take a sharp knife and stick in the roof of the mouth, piercing the brain.

For most markets the fowls should be dry picked, as they will sell for from one-half to one cent per pound more than if scalded.

Begin picking as soon as the bird has been stuck, removing the long tail and wing feathers first, then go to the legs and back, leaving the breast till the last. If you start on the breast as soon as the bird is stuck the blood is apt to follow the feathers and discolor the skin.

Birds will ship better and keep longer when they are not drawn, if they have been properly fasted before killing.

In marketing eggs also the highest price can only be obtained by putting a first-class article on the market. There is more difference in the quality of eggs in summer than in winter, especially in our Southern climate. This is due largely to the common practice of allowing the male bird to run with the hens at all times, consequently the eggs are fertile and the summer heat starts the germ to growing, the eggs are cooled and the germ dies, and a rotten egg is soon the result. Even before the egg becomes rotten it loses its fresh taste and the growth of the germ shows when the egg is examined and it is classed as heated and sells for a much lower price than it would if the quality was

right. This is only one cause of the low price, however. The practice of sending the eggs to market just as they are gathered, large and small, clean and dirty, is also responsible for part of the loss. The less the dealer has to sort the eggs the more he can pay for them. Send the eggs out as uniform in size and color as possible and never send dirty eggs to market. In many cases the dirty and small eggs reduce the price of the whole lot, so that you will get less for the lot than if you had kept these out and sent fewer eggs but better quality.

EGG PRESERVATIVES.

In summer-time eggs are as a rule much lower in price than they are in winter and as a consequence are much more frequently used on the table at home. When the high prices come the temptation to market them is too strong to be resisted and the family often go without many dainties on the table that they may get when eggs are cheap.

There are different methods by which eggs can be kept for six, eight and even twelve months in good condition. The prime requisite, however, is a perfectly fresh egg to start with. These preservatives will keep an egg fresh, but they will not make one fresh when it has started to decay.

The most common method, and one that gives good results, is as follows: Take twelve pounds of lump lime and slake it in clean, pure water; add six pounds of salt and enough water to make ten gallons; stir the mixture thoroughly several times for a day or two and let settle. Use only the clear liquid, putting it in a crock or barrel and putting the eggs in as they are gathered.

Another method is to take one part of water glass and nine parts of water; mix thoroughly and put the eggs in it the same as in the lime water.

DISEASES, PARASITES AND VICES.

In a majority of cases it is neither profitable nor wise to doctor sick fowls. The value of the individual hen is so small that the time and care necessary to make a cure are, in most cases, worth more than the hen. Another trouble is that the more doctoring you do the more you have to do, as every sick hen cured and used in the breeding pen will do her full share to perpetuate in her offspring the weakness which made her subject to the disease which her stronger mate was able to throw off.

The question, then, for the practical poultryman is not so much how to cure disease as how to avoid it. It is not possible to raise poultry in any considerable number and to avoid under all conditions the appearance of disease in the flock, and for this reason I will give here a short description of some of the diseases most commonly seen among farm poultry.

Let us look first, however, at the best methods for preventing or reducing as far as possible the diseases of our poultry.

I think that there is no question that filth is responsible for more sickness in the poultry yard than all other causes combined. It is no uncommon case to find the hens obliged to roost in a dark, damp house, which is cleaned out only when the manure is wanted in the field or garden, and still the farmer wonders that his hens are not more profitable and that there are so many cases of sickness. A house of this kind is the natural breeding place for disease germs and lice and mites of all kinds. If you don't think this is the

cause of most of your troubles, make the experiment for yourself. Give your poultry a dry, well-lighted house, keep it clean and free from insect pests and you will find that the cases of sickness in your flock become rapidly less and your poultry becomes correspondingly more profitable.

The proper feeding of the flock will also have a strong tendency to prevent disease, but as this has been discussed before I will not take it up again.

The immediate removal from the flock of any bird which becomes sick or out of condition will do much to prevent the spread of the disease should it prove contagious.

Some of the most common diseases of poultry are as follows:

Roup.—In its earliest stages it is sometimes difficult to distinguish between roup and common cold, and while some authorities say that a cold will not cause roup, I think there is no doubt that it will bring about conditions which render the fowl very susceptible to the roup again. The first symptoms are a watery discharge at the nostrils, which soon becomes thicker and has an offensive odor. This odor is one of the easiest means of detecting the disease in its early stages, as a person who has had any experience with the disease will readily recognize it if he enters a house where there are affected birds. As the disease progresses the inflammation extends from the nostril to the eye, and the discharge becomes cheesy, often forcing the eye from its socket. In the advanced stages it is seldom advisable to treat the fowl, as the result is doubtful, and in any case the treatment is long and tedious. It is better to kill the bird at once and either burn or bury deeply.

In the early stages, if it is a valuable bird, a cure may sometimes be satisfactorily accomplished. There are a number of guaranteed roup cures advertised, but I have not found any that is a sure cure. If you decide to treat the sick fowl, the first thing to do is to remove it from the rest of the flock so that the contagion will not spread. The nostrils and mouth should be washed with some antiseptic solution, such as two per cent of carbolic acid or two per cent solution of creoline. In the early stages kerosene, either pure or mixed with an equal quantity of olive oil, is often successfully used. A syringe or small oil can is necessary to get the solution well into the nostrils and the cleft in the roof of the mouth.

Chicken-pox or Sore-head.—This disease at times causes serious losses, especially among young stock. It chiefly affects the head and comb, appearing as an eruption of yellow nodules or pimples, varying in size from the size of a pin-head to as large as a pea.

In many cases the disease does not seem to affect the general health of the fowl; but if the disease extends the bird becomes emaciated, the plumage rough, and in some cases death results.

The eyes are sometimes closed by the pimples, and if not released the bird is unable to see and will die of starvation. This is a contagious disease of a fungous nature and is therefore more troublesome in damp weather.

To prevent it keep the houses dry and clean. If it appears remove affected birds and thoroughly disinfect the house. To cure, soften the scabs with warm water and remove them, rubbing carbolated vaseline into the sore or touching the part several times with bluestone.

Limber Neck.—This is perhaps not a very common disease, but I have had several inquiries regarding it the last year, so will mention it.

Affected birds lose all control of the neck and stand with the head hanging down, the beak touching the ground. Later the bird is unable to stand and lies as if dead, occasionally struggling violently for a short time. This is caused by the fowl eating some irritating substance. Decaying animal matter is often responsible for the trouble. I have found turpentine, three or four drops on bread, given three times a day, a satisfactory remedy. Hyposulphite of soda, one teaspoonful in half a cup of water, giving one teaspoonful every two hours, is also recommended.

Gapes is a disease caused by the presence in the windpipe of a small red worm, which is commonly called the gape worm. The symptoms are frequent gaping on the part of the affected bird as if it had difficulty in breathing. It is most frequently seen in young chicks, and it is not often that old fowls are injured to any great extent, as they have strength enough to rid themselves of the worms. The best treatment when the disease appears is to remove the unaffected birds to fresh ground, if possible where chickens have not been before. To cure, there are many treatments recommended, among them removing the worms by a looped hair or fine wire, dipping a feather in creoline and inserting it in the windpipe, turning it around several times, confining the chicks in a box or barrel and dusting with fine air-slaked lime, causing them to breathe the fine particles of lime. The use of air-slaked lime on runs which are affected is also recommended.

Scaly Leg is caused by a small insect which gets under the scales on the legs and feet, living there and producing the rough and unsightly appearance so often found in fowls kept in filthy houses. It is easily cured if taken in the early stages. Take a stiff brush and scrub well with warm water and soap to soften the scales. Kerosene applied to the softened scales will kill the parasite and remove the roughness. The number of times this will have to be repeated will depend largely on how bad the legs were to start with.

The Parasites of poultry may roughly be divided into two classes, lice and mites, the former living on the fowls, the latter in the cracks and crevices of the house and attacking the fowls when on the roost.

The former are most easily gotten rid of, the best method being to dust the fowls thoroughly with insect powder whenever the lice are found. Kerosene applied to the roosts will also be found a good remedy. The mites, which hide in the building, are harder to get at and therefore more difficult to kill. There are several ways of ridding the house of them. The most common is whitewashing with lime wash, to which has been added crude carbolic acid, creoline or some good liquid lice killer. Kerosene emulsion has also been found to kill these pests. The emulsion is made by taking one pound of hard soap, dissolving it in one gallon of hot water, and while hot adding two gallons of kerosene, stirring well till cool. When ready to use add ten parts of water to one part of the stock and put on with a spray pump or brush. Care should be used to get the whitewash or emulsion thoroughly into all the cracks, as it must come in contact with the mites or eggs in order to kill them. Two or three applications are necessary to get rid of all the mites in most cases and should be made at intervals of three or four days.

Egg-eating is perhaps the most troublesome vice which we find among hens. The hens in some cases acquire the habit by eggs being broken in the nest. The hen eats the egg and finds that she likes it and tries another and

soon becomes a confirmed egg-eater. In other cases I think it is a craving for the shell material which starts the trouble.

There are many cures recommended, such as filling an eggshell with mustard and leaving it where the hens will get at it. This may cure in some cases, but I have seen hens that would eat up the shell no matter what you put inside it, and these hens I have cured by giving them all the eggshells they could eat—taking the shells from the incubator after the chicks were hatched and keeping a quantity before the hens for a few days.

There are cases, however, which seem to be incurable, and the only remedy is the hatchet.

Feather-pulling, like egg-eating, may become a serious trouble. It is noticed mostly among the more active breeds when in confinement, and is in most cases started by improper feeding. In most cases the failure to supply animal food is responsible for the trouble, and the easiest remedy is to correct the error in feeding and give the fowls exercise to keep them busy.

FARMERS' INSTITUTES, 1904.

By Tait Butler.

Farmers' Institutes have been held by the Department of Agriculture in sixty counties of the State during 1904. This is probably twice the number held during any other year. On the whole these institutes have been fairly well attended. In fact, in most of those counties where institutes were held last year the attendance and interest manifested this year have been very encouraging for the future success of the work. Of the sixty institutes held, five may be classed as having been *very satisfactory*, giving an average attendance for each institute of 379 farmers, and showing by the part taken in the discussions a lively interest on the part of those present. These institutes were held in Cabarrus, Cleveland, Mecklenburg, Stanly and Union counties. In 11 other counties, Beaufort, Davie, Gaston, Gates, Iredell, Montgomery, Northampton, Perquimans, Pitt, Warren and Washington, *satisfactory* institutes were held, the average attendance being 217 farmers at each.

A third group, consisting of the 23 counties, Alamance, Alexander, Ashe, Bertie, Burke, Caldwell, Chatham, Clay, Edgecombe, Forsyth, Franklin, Granville, Hertford, Lincoln, Madison, Moore, Pasquotank, Polk, Randolph, Rowan, Rutherford, Watauga and Yancey, gave *tolerably satisfactory* institutes, with an average attendance of 133 farmers at each.

For various reasons, the institutes held in the following counties were not as well attended as they should have been, and in some of them a lack of interest was only too apparent: Alleghany, Camden, Catawba, Cherokee, Chowan, Currituck, Davidson, Graham, Guilford, Haywood, Jackson, McDowell, Macon, Person, Rockingham, Stokes, Surry, Swain, Vance and Wilkes. It is only fair to state that while we have classed the institutes held in Hertford, Pasquotank and Lincoln counties as only *tolerably satisfactory* and those in Currituck and Camden as *unsatisfactory*, this was not due to any apparent lack of interest, but to extremely unfavorable weather conditions. Moreover, in many of those counties where the institutes proved unsatisfactory from lack of attendance and interest, institutes had never been held before, or, at least, not recently.

Notwithstanding that the Farmers' Institute is an established educational institution in nearly every State in the Union, and is of twenty years' standing, there are still large numbers of North Carolina farmers apparently unfamiliar with its objects or purposes. It will, therefore, not be amiss to again state what we regard as some of the chief aims of the Farmers' Institute. Many seem to think the object of a Farmers' Institute is to lay down set rules by which farmers should run their farms. Or, as it is frequently expressed, to "tell them how to run their farms." It is not surprising that farmers have little confidence in the ability of any man to tell them how to run their farms, but it is strange, beyond ordinary understanding, that they should think institute workers suppose they can do any such thing. Institute workers are usually men of common sense, that know the man living on a farm *ought* to and usually *does* know more about the conditions involved in

the running of that farm than any other person. If *he* does not know how to run it no one can tell him how. However, this is no reason why a greater knowledge of farming operations will not be advantageous to the man who must manage any farm. Nor does it offer any reason why the institute worker may not be able to give the farmers facts which they can carry home and apply in their business. The farmer must usually spread his energies over the entire field of farming. This is a larger field than any human mind can cover; for it involves a knowledge of chemistry, if he is to understand his soils and the use of fertilizers; of botany, if he is to know how the plants feed and grow; of entomology, if he is to know how to combat the insect and other pests which attack his crops, and of the breeding, feeding and care of animals, if he is to get the most out of his feed and prevent disease among his live stock. The institute worker usually is a man who devotes his entire attention to one of these single lines of work, or a small part of it, and, therefore, it would be inferred that possibly, yes, probably, he may find out some facts in his particular field of value to the farmers which they have not been able to learn, because they are, as previously stated, compelled to spread their efforts over a larger field. But right here is involved a difficulty which it is hard to overcome. The farmer lacks confidence in the information brought to him by any man who does not dissipate his energies over the whole field of farming, just as he is compelled to do. He calls the experimenters, or specialists, "book farmers" and experimental evidence "theory."

Let us use just one illustration which may serve to give us a new and, I hope, a correct idea of what constitutes the "practical" and the theoretical information. We desire information regarding the value of a certain food for the production of butter. There are two classes of men, to either of which we may go for our information. Let us describe the manner in which these two classes of men have obtained their information, and then we may, perhaps, be able to decide which can give us the best practical information. One has fed his herd of dairy cows for years, but he never weighs the feed. He guesses at the amount of food consumed by the herd and by each cow, but may know that one cow will eat a half more food than another to produce the same amount of butter fat. He never weighs the milk, nor does he test it to accurately ascertain the amount of butter fat which it contains, although he probably knows that two quarts of one cow's milk are worth three of another. He did not weigh the cow when he began feeding nor when he closed the trial of this food; hence, he does not know whether she gained or lost, except as he is able to *guess*. He did not weigh the food nor the butter produced; hence, he does not know the cost of producing a pound of butter, and therefore can't know the value of the food given, except as he is able to *estimate* it.

The other man to whom we may go for information has used the scales instead of guessing. He weighs the food each cow receives and the milk she produces. He tests the milk and knows how much butter fat is produced by every pound of food consumed. He weighs his cows when he begins and when he finishes the test. He repeats these tests numerous times and with a large number of cows, but he guesses at nothing. He uses the scales so freely and regularly that his operations may prove unprofitable financially, because of the extra work and time consumed, but shall we go to him for the information we need, or to the man who "guesses"? Which is the *practical* and which the

theoretical man, the one who guesses or the one who weighs? I believe the man who takes things for granted or guesses at the results of his operations is the "theoretical" man, and the one who takes the pains to know his results are accurate is the practical one; and for my information I shall go to the man who can give me definite, practical information, even if the extra work which he did to obtain that definite information made his operations financially unprofitable.

One object of the Farmers' Institute is to carry just such definite information to the farm. Is *knowledge* any less valuable to the farmer than to the doctor or lawyer? To obtain definite information of the sort described, the State is maintaining three Test Farms for the testing of the different amounts and kinds of fertilizers, different varieties of corn, cotton and other crops, different methods of cultivation, etc. To carry this information to the farmers of the State is one of the objects of the Farmers' Institute. To give the farmers of this State the results of the experimental work done in other States is another object of the Farmers' Institute. To bring farmers together that they may discuss their business is another and a most important object of the Farmers' Institute. In North Carolina this phase of the institute has not received proper attention. This will undoubtedly continue until the Farmers' Institute meetings have become a regular feature of the farmer's methods of education and progress. This aim can only be attained through local or county Farmers' Institute organizations.

As a nucleus or start for permanent local organizations that will finally take charge of the arrangements for the institute and push the work to the point of making it of popular interest, a successful effort has been made to organize a committee of active farmers in most of the counties where institutes have been held this year. One active man was selected by those at the institute from each township in the county, and a chairman chosen from among their number. When the people of any of these counties again desire an institute (and they should have at least one each year), it will be much easier for this committee by conferring with the Director of Farmers' Institutes of the Department of Agriculture to arrange a suitable date, choose appropriate subjects for discussion, select speakers and distribute advertising matter than by the method heretofore used.

On the following pages are several of the "talks" made at Institutes during 1904.

THE HOME FRUIT GARDEN.

By H. Harold Hume, State Horticulturist.

Every farmer should have his own fruit garden. The consumption of fruit has increased enormously in the United States in the last decade or two, but, strange though it may be, this increase has been in the cities and towns rather than in the rural districts. Too frequently the farmer's diet is restricted, and fruit does not enter as largely into it as it should. Every farmer's table should be provided with a bountiful supply of all the kinds of fruit that can be grown in his section.

Fruits are not valuable in the diet because of the actual amount of nutriment which they contain, but because of the aid that they give to digestion. They assist materially in a healthy intestinal action and their use in greater abundance will result in better health for the family, and to a considerable extent reduce the cost of living.

Moreover, in these days we hear much about various preservatives which are put into many of the canned goods sold on the market. If fruit is canned and preserved at home this danger will be obviated, and I leave it to any one who appreciates something good to eat whether the marmalades, jellies and preserves made in the farmer's own kitchen by his wife or daughter are not superior to anything which can usually be purchased in the stores.

The location of a fruit garden near the house will assist materially in making things more homelike, a point which every farmer should have in mind. Too frequently the fences about the home are broken down and their places taken by masses of weeds and briars, while the last coat of paint on the house was probably put there a considerable time since by Messrs. Sun, Wind & Weather. These things should not be, and the presence of a well-tilled block of fruit trees adjacent to the house certainly assists in making the surroundings more homelike and cheerful.

The lack of land need deter no one; the farmer usually has land in plenty and to spare. One acre is sufficient to grow an abundance of fruit for the ordinary family; yes, and, besides, from this acre of ground there will be fruit to dispose of in market.

Fertilizer there is or should be in plenty. Nothing is better than stable manure supplemented by a little potash and phosphoric acid. Some sort of leguminous crop, such as cowpeas, red clover or crimson clover, can be grown and turned under, and in this way the proper food for the development of the trees can readily be secured.

The time required for looking after this acre of ground would probably not amount to more than a week in all, each year, for the several operations of cultivation, pruning and spraying.

PLAN OF ONE ACRE FRUIT GARDEN.

The following list and number of trees and plants may be placed on one acre of ground. The conditions in North Carolina vary considerably, and no one list of fruit plants can be given which will be adapted to all sections. Yet, where some of those listed below will not succeed, others that will may be substituted for them. The place of the blackberries and dewberries, for instance, might be taken, in western sections, by currants and raspberries. Figs will not succeed in the western part of the State, except in extremely favored spots, and their place would have to be given to something else. In the West, in the mountain region, the filbert (*Corylus avellana*) might be substituted for it. In this suggestive list for planting no mention has been made of the pecan nut. This nut can be grown all through Eastern North Carolina, and no farmer should be without a few trees. In the garden plot they might be substituted for a part of the pear trees, or they may be planted as shade trees about the house or otherwise provided for. Throughout the Coastal and Piedmont sections the Muscadine grapes do well, and one or two vines at least should be planted.

LIST OF TREES FOR ONE ACRE.

16 Plum—1 row, 15 feet for the row, 13 feet apart in the row.
32 Peach—2 rows, 15 feet for the row, 13 feet apart in the row.
16 Cherry (sour)—2 rows, 20 feet for the row, 26 feet apart in the row.
16 Apple—2 rows, 20 feet for the row, 26 feet apart in the row.
16 Pear—2 rows, 20 feet for the row, 26 feet apart in the row.
20 Fig—1 row, 12 feet for the row, 10 feet apart in the row.
45 Blackberry—1 row, 4 feet for the row, 4 feet apart in the row.
45 Dewberry—1 row, 4 feet for the row, 4 feet apart in the row.
20 Grape—1 row, 10 feet for the row, 10 feet apart in the row.
1,050 Strawberry—5 rows, 3 feet for the row, 5 feet apart in the row.

VARIETIES.

The exact selection of the varieties for the several parts of the State is extremely difficult. Local conditions have much to do with the success of any variety, and this intimate knowledge of local conditions is extremely hard to secure. The following list will answer for some sections, and the varieties may be varied as desired:

Plums—Wild Goose, Abundance, Red June, Green Gage.

Peaches—Greensboro, Triumph, Carman, Elberta.

Cherries—In the western part of the State the Sweet Cherries may be planted with good success, particularly in the northwestern counties. For the eastern part of the State, the only varieties that can be recommended are the Morellos, of which the Common Morello is probably best.

Apple—The apple list must be varied for the different sections of the State. A selection can be made from the following list: Red June, Early Harvest, Strawberry, Bonum, Virginia Beauty, Yellow Transparent, Winesap, Stayman, York, Grimes Golden.

Pears—Keiffer, LeConte, Seckel.

Figs—Celestial, White Adriatic, Brunswick.

Blackberries—Wilson.

Dewberries—Lucretia.

Grapes—Concord, Delaware, Niagara, Catawba, Moore's Early.

Strawberries—Lady Thompson, Brandywine, Excelsior, Hoffman.

Pecans—Schley, Stuart, Frotcher, VanDeman.

Muscadine Grapes—Scuppernong, James, Thomas.

PURCHASING TREES.

Too frequently the trees are purchased from the traveling tree peddler, who comes from—nobody knows where, and goes back, presumably, to the same place. Frequently the trees are not adapted to the locality in which they are to be planted, and the farmer is enticed into buying something entirely unsuited to his conditions. A legitimate nursery business can be done through agents, but the farmer should inform himself in regard to whom the agent represents and where his trees are grown. Beware of fake varieties and new-fangled methods of propagation. Some agents would have us believe that the nursery business is a great secret, but this is not the case, and the trees sold throughout the country are grown from buds, grafts and cuttings. Buy the trees from a reliable nurseryman, determine what varieties you want and be satisfied with none others.

PREPARATION OF THE GROUND.

The best previous preparation for the garden ground is to plant it in cowpeas, soja beans or red clover, and in autumn, previous to preparing the ground for the trees, plow this crop back into the soil. Break the ground deeply and prepare it thoroughly. Dress with stable manure at the same time, if possible. Ground can never be prepared for trees as well after they are set out as before.

CARE OF FRUIT GARDEN.

Do not set out trees with the intention of letting them take care of themselves; unless you are determined to properly care for the trees, better not set them out. Do not plant them and let them take care of themselves. The insects and the fungous diseases will be the only things benefited thereby. Do not plant them and let the cows eat the tops off!

Vegetables may be cultivated in the home fruit garden, but the trees and plants should not be lost sight of. Every effort should be made to put them in shape to get the money out of the acre of ground. This should not be attempted through the growing of any crops detrimental to the trees. Wheat, oats or rye, except as winter cover crops, should be excluded. Corn, cotton and tobacco would be better planted elsewhere; they have no place in this plot of ground; but if any crop is planted fertilize liberally, so that there will be enough for the trees as well. Grow cowpeas, red clover or crimson clover and turn the crop back into the soil. Fertilize with stable manure supplemented with potash and phosphoric acid.

The pears should be planted at one side of the plot, so that if found necessary to control the blight they may be put in grass and kept that way. The secret of the management of pear blight is to have the wood formation of the tree hard and firm and prune out blighted branches as soon as they appear.

Lastly, the trees should be pruned from year to year, so as to give an open head to admit plenty of air and light, which will go a long way towards holding diseases in check. The spray pump must be used systematically if good, sound fruit is desired. To enter into a discussion of this phase of the farm fruit garden would require more time than I have at my disposal, but any one desiring information along these lines can secure it by addressing the North Carolina Department of Agriculture, Raleigh, N. C.

MELONS AND HOW TO GROW THEM.

By B. T. Price, Charlotte, N. C.

Mr. Chairman and Gentlemen of the Institute:

I want to talk awhile to-day on growing melons as a market crop. The melon crop is one that will not bear neglect. If you are negligent or lazy I want to advise you never to grow melons as a market crop, for if you do you are sure to make a failure. Men of this class usually express themselves by saying: "Somehow I never have any luck with melons." This is one crop

you can't raise by luck, but by applying the best scientific principles known to the agricultural profession. The first thing to be considered in growing melons is the kind of soil best suited to their growth. I used to think, when I was a much younger man than I am to-day, that you could only grow them successfully on river bottom or lowland of a sandy nature, but I find there never was a greater mistake than this, for the fact is, we can grow larger melons and of much better quality on our sandy or gray uplands than we can on the finest river lands. Then, I would advise you to select a piece of sandy or gray upland, with a red clay subsoil, naturally well drained; that is, so no surface water will stand on the ground and scald the vines. The next thing to be considered is the preparation and fertilization. I do not hesitate to say that to make the largest yield of melons you should subsoil the ground two months or more before planting time. This early plowing is necessary, because if the ground is plowed deep later than this it will be too loose and porous to allow the young plants to start off quickly in the spring.

Now, if you think you cannot afford to subsoil, then about the next best thing you can do is to take a two-horse turn plow and commence four feet from one edge of the patch, the way you want the rows to run, and run a furrow, throwing the dirt towards the outer edge of the patch. Now lay off a strip four feet wide and plow it out, making a good, deep furrow when finished. Now skip over ten feet from the center of your water furrow and plow out another four-foot strip; continue this until the whole field is gone over, and you will have your ground laid off into twelve-foot rows, with a good, deep furrow plowed out on each row in which to place the fertilizer. This is done in order to save the labor of scooping out holes for each hill, as is the practice of some, and it is just as good or better and much easier done. Now take a small scooter plow, lay off the patch into twelve-foot rows, running straight across the furrows that are already made. This places your hills twelve feet apart each way, which is the distance best suited to large varieties of melons. Some six weeks or two months before time for using, make a compost of stable manure and woods mould, using about two-thirds manure and one-third mould. Now scatter at each check from two to three good forkfuls of this well-rotted compost, and let it cover a space at least a yard square. On this compost scatter a pint of good commercial fertilizer, composed of acid phosphate 1,000 pounds, cotton-seed meal 600 pounds, kainit 400 pounds, letting the fertilizer cover the same space as the compost. Now take the turn plow and throw the dirt back into the deep furrow, making a good, high bed some four or five feet wide, and have all this done at least three weeks before planting time. Now harrow this ridge thoroughly with a good disk or cutaway harrow until there is not a clod to be seen; keep the crust broken on this ridge after each shower, and a few days before planting take a hoe and make large flat hills, raised just a little above the level of the general surface of the ridge. The furrow with the scooter plow across the unplowed strip marks the hills. Just as soon as you can do so, plow the unbroken strip and harrow fine immediately. I put a lot of stress on thoroughly harrowing the land, for I find the secret of success in growing vines depends on the fineness and mellowness of the soil.

You must necessarily make the air spaces in the soil as small as possible to enable the young plant to take up and appropriate the plant food stored in the soil. Soil made fine retains more moisture, and will hold moisture

longer than soil that is lumpy and has large air spaces. When the soil is thoroughly warm, usually about the first of May in this section of the State, plant from four to six sound seed in each hill, so as to insure a regular stand. Should a shower fall before the young plants get up, break the crust very lightly on each hill to let the plants through. From this time till the crop is laid by keep the crust broken after each shower.

As soon as the soil is in condition to work, cultivation should be given once each week, whether it rains or not, provided the soil is not too wet. The first cultivation, especially if there have been hard, beating rains, should be given with a cultivator run rather deep. Let the subsequent cultivation get shallower at each working until the work is completed, which is not until you have a strong, healthy vine, with good, large shapes on it. Some melon growers will take issue with me here, I know, but this has been my practice for the past fifteen years, and I have never yet had any cause to change my method, but, on the contrary, good encouragement to keep it up. I have seen crops of melons very much diminished for the lack of another working.

These cultivations should all be given with some wide-cutting implement, as a disk harrow, smoothing harrow or heel scrape, run shallow. Never cultivate vines while wet with dew or light rain, as it may cause the leaves to scald or rust.

As soon as the plants begin to bunch and throw out runners, thin to one plant in a hill. I want to call attention to this especially, as most writers recommend leaving two, and some three, plants to the hill. This is a mistake where you are aiming to raise fancy melons that will command the highest prices. It is also a mistake if you think you can raise more tons of melons to the acre by leaving two or more plants to the hill.

Nothing can take the place of a good hoeing to start the young vines into vigorous and healthy growth. It is better to let the hoeing alternate with the plowing, provided the plow hands are careful to uncover all vines; if not, hoeing should follow immediately. After the vines begin to run they must be turned out of the way to avoid tramping with the team, or breaking with the plow. The practice here is when the runners get long to take up the vines and lay them back straight over the hills, putting the top side down from one side of each row at a time, which leaves every other middle clear of vines, plow these out and turn the uplifted vines back into the middle already plowed, giving them as nearly their original position as possible. Treat the unplowed middles the same as the first and the work is accomplished with the least possible injury to the vines. This looks like tedious work, but trained hands do it very rapidly and with little damage to the plants.

As soon as plants commence putting on shapes it is necessary to go over the patch two or three times a week and cut off all defective shapes, such as gourd neck, rotten end and so forth, for they take vitality from the vines and would amount to nothing if left on. I find it best to leave all nice, well-formed shapes, for strong, healthy vines will support all they will take on. Let this removing of imperfect melons continue till the crop is nearly matured. There is no part of the cultivation that will pay better than this if it is thoroughly and judiciously done.

Now a few words about the enemies of the melon plant. By far the worst is the little striped bug which attacks the young plants as soon as they are up, often killing them in a day or two. They keep up their ravages some-

times during the whole growing season, but it is during the earlier stages of growth, while the plants are young and tender, they do their greatest damage. The best remedy for the bugs I have ever tried is a recipe given me by Mr. W. N. Peeples. Take one-half peck sifted ashes, one-half peck air-slaked lime and one tablespoonful of Paris green, mix thoroughly and put in a tow sack and give a jerk over each plant while dew is on. I have tried this the past two seasons and have had no trouble with the bugs. Of course this must be repeated after each shower or until the bugs all disappear. The cut-worm is another enemy. You can get all the information you need by sending to the Department at Raleigh for bulletin on insect pests and enemies.

Now a few words about varieties. For a fancy market melon I know of nothing equal to the N. C. Bradford. It grows large and is of excellent quality and a good bearer, besides being one of the most showy melons I have ever seen. A great many melon raisers make the mistake of planting several varieties on the same piece of land. They claim by doing this to be able to give a customer any kind of melon he wants. This is a very serious mistake, as melons mix badly where different varieties are planted together, and in doing so often partake of the poorer qualities of each. If you have but one variety, and it the best you can get, you will have little difficulty in suiting your customers, for a good melon is what they all want, regardless of shape or color. The Bradford is suitable only for the nearby or home market, as the rind is too thin to bear a long shipment.

By following these directions you ought to be able to raise melons weighing fifty to eighty pounds, and you ought to easily raise from eight to ten tons per acre.

INSECT PESTS AND SPRAYING.

By Franklin Sherman, Jr., Entomologist.

Introduction.—In such brief space as we have at command we can only consider, very briefly, a few of our very worst insect pests.

The apple crop has in recent years been almost a complete failure in many sections of our State, and as it is by far our most important fruit, taking the State as a whole, and as this great loss can be very materially lessened at but slight cost, we will give special consideration to the insects attacking that fruit.

Round-head Apple Borer.*—Adult beetles lay eggs at base of trees in early summer. The larva bores in inner bark and sapwood, often girdling and killing the trees. It takes from two to three years for the insect to reach maturity. It is not serious in this State except in the mountain section.

Remedy.—Dig out borers in March. After this paint base with white lead or whitewash. Repeat the treatment each winter.

Scurfy Scale.—Scale about as large as head of pin and white in color. Winters in egg stage, eggs being reddish in color and may easily be found in

*A special Circular on this pest will be sent on application to the author.

winter by turning over scales. Common in the western half of the State on trunk and branches.

Remedy.—Spray with kerosene emulsion at 15 to 20 per cent oil* when the eggs begin to hatch in spring. Repeat in fall if needed.

Oyster-shell Scale.—Scale about an eighth of an inch long, shaped like oyster-shell and brown in color. Winters in egg stage, eggs being pearly white, and may be found in winter by turning over scales. Common in the mountain section on trunk and branches.

Remedy.—Same as for Scurfy Scale, just discussed.

San Jose Scale.†—Scales as large as pin head at largest, round, flat and gray in color. Has no egg stage, young being born alive. Not yet thought to be in all localities, but is known to be in about 50 counties from one end of the State to the other. Attacks trunk and branches. When badly infested the tree looks as if it had been dusted with ashes.

Remedy.—Spray with lime-sulphur-salt wash‡ in winter while trees are dormant.

Caterpillars.—Various species of caterpillars feed on the leaves of the apple tree. All may be combated by spraying with Bordeaux Mixture and Paris green, as described later.

Codling Moth.—This is by all odds our worst apple pest. Adult moths appear about blooming time and deposit eggs on young fruits. The caterpillar enters the blossom end of the apple, making "wormy apples" and causes the "early drop" or June drop.

Remedy.—Spray with the Bordeaux Mixture and Paris green, as described later.

We now come to the consideration of some other insect pests aside from those that attack the apple.

Cabbage Worms.—There are two species, one of which lies flat on the leaf and the other a "looper" or "measuring worm." The first develops to a white butterfly, and the "looper" into a brown moth.

Remedy.—Poison the worms with Paris green by either of the two following methods:

1. Mix Paris green with air-slaked lime at the rate of one ounce green to two pounds lime. Mix very thoroughly and then sift to make more thorough. Dust on the plant from a loose sack by merely shaking the sack.

2. Shave a quarter of a cake of soap in a gallon of water and boil to dissolve the soap. Add water to make five gallons and stir in one-half ounce of Paris green. Apply with a spray pump.

[*Note.*—There is not the slightest danger from either of the methods here mentioned. If the first method be used, applications must be repeated every few days to replace what is washed off by dew and rain. The leaves to which the poison will be applied are the outside leaves, which are always removed, and even if not, the mixture is so diluted that it would be impossible for one to eat enough to have any detrimental effect whatever. The writer has used the Paris green on his own cabbage, and speaks from experience.]

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*A special Circular giving directions for preparing the emulsion will be sent on application to the author.

†A special Circular regarding this pest will be sent on application to the author.

‡A special Circular giving directions for making and applying this wash will be sent on application to the author.

Potato Beetle.*—This pest is well known to all farmers and gardeners.

Remedy.—Spray potato vines with Bordeaux Mixture and Paris green, as described later.

Cabbage Bug.†—A black and yellow bug about half an inch long, which is very bad on cabbage, collards and similar crops. Worse in warmer parts of the State. Young bugs are quite similar to the adults, but cannot fly. They suck the sap from the leaves; hence cannot be poisoned.

Remedy.—Pick the bugs off by hand early in the season before they become numerous. This work is best done in early morning. By not planting until late (August 1st at Raleigh) one may often escape serious injury from this pest.

Chinch Bugs.—Small grayish or blackish bugs with white wings. When full-grown a little over an eighth of an inch in length. Very destructive some years to corn, wheat and oats in the middle and northeastern sections of the State. The adult insects pass the winter under boards, stones, dead grass, etc. The young bugs are much like the adults in form, but are reddish in color.

Remedy.—Cleanliness about the farm. Burn trash, etc., that would make winter quarters. When they start to invade a field, plow deep furrows before them, throwing the earth *toward* the bugs, thus compelling them to climb the steep side of the furrow. As they collect in the bottom of the furrow they may be destroyed by burning with straw, spraying with pure kerosene, or by dragging a log along bottom of furrow.

Hessian Fly.‡—Small fly which lays eggs on young wheat in fall. Eggs hatch to small maggots, which work around the joints of the stalk, causing weakening and death of the plant. Two broods of the insect each year, one in spring, the other in fall.

Remedy.—Late planting. November 1st seems to be a good time for sowing. Burn over or plow under (or both) stubble as soon as harvest is over.

Peach Borer.§—General habits similar to the Round-head Apple Borer, already described, but the parent insect is a moth, and it only takes one year to reach maturity.

Remedy.—Worm trees in March and mound earth at base to height of six or eight inches. Remove mound in November so that winter freezes will kill some of the insects. Keep up the treatment each year.

House Flies.—Well known to all. Adult insects lay eggs in horse manure, in which the larvæ live. Flies, from their active flight and habit of frequenting all sorts of filthy places, doubtless play a part in the spread of typhoid fever and other diseases.

Remedy.—Cleanliness about horse stables, keeping the manure covered or sprinkled with acid phosphate to prevent flies depositing eggs and to kill larvæ. Keep wire screens in doors and windows, and sticky fly-paper in houses. Use air-slaked lime freely in outhouses.

Mosquitoes.—Well known to all. It has been quite recently discovered that yellow and malarial fevers are practically dependent on certain species of mosquitoes for transmission to man. Adults lay eggs on water, which hatch to the "wigglers" or "wiggle-tails." These in turn transform to mosquitoes.

*A special Circular on the Potato Beetle will be sent to any one on application to the author.

†A special Circular on the Cabbage Bug will be sent to any one on application to the author.

‡A special Circular on the Hessian Fly will be sent on application to the author.

§A special Circular on the Peach Borer will be sent to any one on application to the author.

Remedy.—Keep cisterns, rain-water barrels, etc., securely screened so that the adults will not lay eggs. Take care that there are no receptacles of any kind in yards which hold water, such as tomato cans, sardine boxes, bottles, etc. . Such places often furnish mosquitoes in great numbers. In fighting them on a more extensive scale, the swampy lands and stagnant pools must be drained or filled so there will be no breeding places.

SPRAYING.

Thus far we have considered only the insects, but we must now consider the subject of spraying, by means of which many of the pests of crops may be combated. We will first briefly consider the different types of pumps and the uses to which each is suited.

Bucket Pumps are made so as to set in a bucket of the material and be carried about from place to place and set down wherever it is desired to spray. Suitable for small gardens and orchards of up to 150 or 200 trees. *Knapsack Pumps* are made with the pump made into a tank so that the whole is strapped on the back of the man doing the work. Especially suited for work on potatoes, grapes, tomatoes, cabbage and other low-growing plants. Not best for orchard work, but may be used. *Compressed-air Sprayers* are similar in type to the Knapsacks, but are worked by pumping up a pressure of air, after which they run automatically for several minutes. *Barrel Sprayers* are larger and fitted into barrel, to be hauled about the orchard in wagon or cart. These are best for orchards of 200 trees or more which are level enough so that a cart can be driven through.

Any person who intends to get a spray pump should get catalogues from several firms and study the styles made by each and then buy the one that suits him best. Be sure to get plenty of hose to reach tops of trees, and suitable nozzles. Following are some reliable firms:

Deming Company, Salem, Ohio.
Sydnor Pump and Well Co. (agents for above), Richmond, Va.
Field Force Pump Company, Elmira, N. Y.
E. C. Brown Company, Rochester, N. Y.
William Stahl, Quincy, Ill.
Gould's Manufacturing Company, Seneca Falls, N. Y.
P. C. Lewis Company, Catskill, N. Y.
Rochester Spray Pump Company, Rochester, N. Y.

How to Spray.—In spraying, the object is to thoroughly *dampen* all the surface of the plant to be treated. It should not be soaked until the material runs off in streams or down the trunks.

How to Make Bordeaux Mixture and Paris Green.—To make one barrel of this material we use:

5 pounds Stone Lime.
5 pounds Bluestone.
50 gallons water.
5 ounces Paris Green.

Slake the lime in a keg or barrel and add water to make 25 gallons. Tie the bluestone in a cloth sack and hang it in a tub or keg, so that it is just under water. When it is dissolved, add water to make 25 gallons. When it is desired to use, take equal parts of each and pour together so that the two shall fall in one stream into a third tub, keg or barrel. Now add the Paris green

at the rate of one ounce of green to each 10 gallons. Mix the green first with a little water in a cup or saucer to make a thin paste and then wash out into the mixture.

When the bluestone solution and the lime solution are kept separate they will keep through the season, but when they have been poured together to make the complete mixture, it must be used that day, as it rapidly decreases in value after once mixed. Only mix what is needed in each day's work, and any small amount remaining should be thrown away.

Any spraying mixture must be carefully strained to remove sediment, so that the pump shall not become clogged.

Mixtures should be kept stirred. Some pumps are provided with an automatic stirrer.

Spraying Apples.—Apple-trees should be sprayed at least three times each spring with the Bordeaux and Paris green. *If this practice were followed by all farmers and fruit growers in the State, the total apple crop would be nearly, if not entirely, doubled in value,* and any individual who takes up the practice can easily derive great benefit in his own orchard.

The three times for spraying are:

1. Just before the buds burst.
2. Just *after* the blossoms fall.
3. About two weeks after second treatment.

Such a system of spraying will not only check caterpillars and codling moths, but also a number of fungous diseases which do great damage.

Spraying Potatoes.—Potatoes should be sprayed at least four times each season, thus protecting them from the Potato-beetle, Flea-beetles and various blights and other fungous diseases. The treatments should be made: 1st, as soon as first leaves are well out; 2d, 3d and 4th, following as rapidly as needed to keep all newly-grown foliage covered and to keep the beetles from getting a start. Such a system of spraying for the potato will *far more than pay for itself, even if there were no Potato-beetles to be fought.*

Spraying Grapes.—Grapes should be sprayed anywhere from three to ten times, depending on the extent to which the grapes are affected by rots, mildew, etc. Four times is usually enough to give great benefit, but many of the best growers prefer to spray much oftener. The first treatment is given just as soon as the fruit is well set and the last application is given about the time the fruit begins to ripen.

In spraying grapes there is not so much need to use the Paris green, as the vine is not usually much attacked by caterpillars, etc. It may, therefore, be left out, but if caterpillars or leaf folders are present in sufficient numbers to do any damage the Paris green should be used to check them.

Cost of Spraying.—The Bordeaux Mixture and Paris green costs not more than 1½ cents per gallon. The most expensive spraying mixtures do not cost over 5 cents per gallon. A gallon will spray a full sized apple-tree of from eight to ten years. When used in regular orchard work the three treatments of Bordeaux Mixture and Paris green should not cost more than 20 cents per tree at the outside, including labor. The returns are far greater than this cost.

Conclusion.—If the farmers, fruit growers and truckers of this State will put into regular and thorough practice the suggestions here recommended, it will save hundreds of thousands of dollars in money value of crops for sale, and also add much to the comfort and pleasantness of home life.

SOIL DISEASES IN NORTH CAROLINA.

By F. L. Stevens.

Plants are so subject to blights, decays, molds, mildews, rusts, spots, wilts, etc., that the farmer, the practical plant grower, is very liable to think that their natural condition involves such stages, and that the presence of such adverse conditions is to be regarded as unalterable, and inevitably a matter to be decided upon by Divine Providence alone, as something quite beyond the control of the farmer himself.

Knowledge concerning the real cause of decays, disease, etc., is a matter of comparatively recent date, and the men are still living who discovered the fungi and bacteria which do this damage, for it is really living organisms which invade our crops and produce the symptoms which we recognize as sickness. Enough is known already concerning these plant diseases to enable the farmer to diminish or completely prevent their injurious attacks. Knowledge concerning the newer methods, however, is spreading very slowly, and much work remains to be done in North Carolina concerning these diseases both in discovering methods of eradicating them and in spreading knowledge concerning such means as we already have.

There is one class of diseases which is particularly prevalent in the South, namely, those diseases which reside permanently in the soil and infect the susceptible crop each time that it is replanted upon the affected soil. Examples of such diseases are the watermelon wilt, the Granville tobacco wilt, the tomato wilt, the cabbage yellow side, the cotton wilt, the cowpea wilt, and the club foot of the cabbage, collard, turnip and related plants, the onion smut, the scab of the Irish potato, and some other less conspicuous diseases. These diseases all agree in the fact that they are caused by fungous or bacterial parasites, and that these parasites, or germs, produce innumerable spores, which, left in the soil over winter, lie ready to infect any susceptible plant which may be placed in the soil.

As a rule, soil which is capable of producing one disease by no means necessarily produces another disease. These diseases are not at all identical. Lands may be in such a condition that they will not produce melons without suffering from the wilt, but at the same time will produce cowpeas or cotton. Another field may not produce cotton, but will produce other plants.

The farmer should recognize that the disease germs reside in the soil, and that repeated planting of a susceptible crop serves ever to increase the number of germs, and thereby the destructiveness of the disease. A disease of this nature may always be recognized by the fact that repeated plantings bring an increase in the destructiveness of the disease, the diseased area each year growing larger and the disease more fatal. When the presence of such a disease is recognized, every step should be taken to guard against the infection of new fields. To do this the farmer should know how such diseases spread. Anything which can carry the germ to the new field can spread the disease. When we recognize that the soil abounds in these living organisms, it becomes clear that the transference of even a very small quantity of this

soil to a new field may spread the disease. Soil may be carried from field to field on the feet of animals or man, on tools, and by washing, and in all of these ways this class of diseases is spread.

If such diseases affect one of your crops, you should use the utmost care to prevent them getting in others, avoiding in every possible way the carrying of soil from the diseased into the healthy field. So, also, should you guard against carrying the soil from the diseased field into the healthy field, since by so doing you would also spread the disease. This is often unwittingly done in the case of the watermelon wilt by raking up diseased vines with the cowpea hay, and then allowing portions of these vines to reach the manure pile, and thence find their way to new soil.

Some soil diseases can be controlled by the application of chemicals to the soil. This is true of the onion smut and the club foot of turnips, etc., but as a rule a field once infected must be allowed to rest for many years before planting it again to the susceptible crop. The greatest care should be taken to avoid infection.

The one other great hope lies in the procuring of such plants as are able to resist the germ which causes the diseases. This desirable end has been attained with the cowpea, and a variety now exists which will grow in soil affected with the cowpea wilt. A similar statement may be made for cotton, and great advance has been made toward the securing of such varieties with which to meet the watermelon and tobacco wilts. At present, however, the farmer's chief attention should be directed toward preventing the spread of the disease to unaffected soil.

FORAGE FOR THE FARMER.

By C. C. Moore, Dairyman, Charlotte, N. C.

In my opinion this is the most important, yet the most neglected source of profit on the average Southern farm.

Here and there on our Southern farms will be found a large barn for storage of forage; these, however, are few. The average barn is so small that, even if the farmer were so disposed, he could not shelter provende sufficient for winter feeding of his few head of stock.

How many one and two-horse farmers can you now recall who had rough food in abundance the past winter for all their stock?

The farmer who provides plenty of long forage has walking advertisers telling the fact to all persons who pass or go onto his farm. His stock tells the tale. He may be short of corn and oats, but if the barn loft is full, his horses and cattle are full and do not feel the need of a full crib or grainery.

So it seems to me that the first consideration, when laying plans for crops to be produced, is to provide for forage and give its crop precedence over the money crop, let that be cotton, tobacco or grain.

Forage in abundance is the backbone of good farming, and no farmer is living up to his rights and privileges if he is dependent on some other farmer for his roughness.

Can you show me a farmer who can afford to buy hay? Look at prices: best hay, $22; mixed, $20; prairie, $16; pea, $20; oat straw, $12; wheat straw, $8; shredded stover, $8; cotton-seed hulls, $9. To buy feed at these prices will bankrupt any farmer. Raise and sell all you cannot feed.

I think the price of cotton-seed hulls is a great blessing. I will be glad to hear that next season the price will be $20 per ton. I anticipate an advance over present prices, and if $20 is the mark the advantage to our farmers cannot be estimated. What hulls are fed in our country have no effect on the price. The demand elsewhere regulates the price; so if every farmer and dairyman abandons hulls as a feed, the mills will not feel the loss, and that is just what we should do. Let the mills pay the cotton farmer $40 per ton for seed, then sell the hulls for a big price away from home; you get the money.

Far too many farmers have depended upon cotton-seed hulls for rough feed for their cattle, and by so doing their farms are poorer to-day than they would be if all the cattle forage had been grown on their own land. Let us resolve to cut out hulls hereafter and feed our own home-grown forage.

What will a farmer raise as a forage crop? This I will not answer, but can tell you what I think are the cheapest and best crops to raise.

I head the list with corn, the great king of the grass family. Do you want forage, lots of it and good quality? Well, just take one acre of your best cotton land, prepare exactly as you do for cotton planting, using just as much guano and manure. Plant just as thick as your cotton seed are planted and give the same cultivation that you would to the cotton. The yield will astonish you, and if the crop is cut when lowest blades begin to brown, and all is put in good shocks to cure, there will be a food which all stock will eat up clean.

I have used the corn crop in many ways as a forage, have fed stalks long, cut them dry, shredded and made silage of them; anyway I found to be good feed, but the handiest plan is to put the entire crop into silo.

Were I on a farm and had to winter one horse and ten cattle, I would build a silo, and put my corn in it, cutting one-half to one inch long. I would also have an acre or so of thickly planted corn to feed dry and long; then if I could raise and cure pea hay sufficient to feed each animal 10 pounds daily, it would not bother me if the oil mill sold hulls at $50 and meal at $100 per ton. And the price of hay would only concern me when I had it to sell.

The cowpea is at home with us. We can grow as much per acre as can be grown anywhere and we all know that if we have plenty of this high protein feed, we do not care if corn is $1 per bushel. We do not need corn with pea hay. Every man here knows how to get pea hay, so I will not advise.

Soy beans, millet, sorghum, and other summer crops yield immense crops. All are good forage plants and easy to cure.

Even the press of work on a cotton farm should not prevent the production of ample forage for all stock, and plenty to sell also. The cotton farmer can make his forage crop grow through the winter months. The seeding and cultivating will not interfere with the summer attention to cotton or tobacco.

He may sow winter oats in August and make hay of the crop when in the "dough" state. This, with me, is a very important forage crop. The time and labor devoted to winter oats pay a big per cent. Crimson clover sown alone or with rye, wheat or oats will produce one to two tons of hay per acre. As a hay crop I like crimson and wheat best. Sowing in September, or not

after 15th of October, this combination can be cured into a soft green hay, which is liked by all stock.

Wheat and oats sown together is another fine combination for hay. The yield on fairly good land is immense. Rye hay is not as good as the above crops, but as it is a sure crop, I always sow a crop and make into hay.

What can be raised on fifty acres? This depends upon the man and the land. If the right man and twenty-five cows are on the fifty acres, the crops will be enormous and the money returns big. The right man will raise on

6 acres corn for ensilage at least 90 tons.
8 acres corn to mature corn, 400 bushels.
8 acres corn to mature stover, 10 tons.
10 acres winter oats to thresh, 400 bushels.
10 acres winter oats to straw, 7 tons.
6 acres of oats for hay, 15 tons.
3 acres of rye for spring feeding, to May 15th.
4 acres of wheat for spring feeding, to June 15th.
2 acres of millet, green feeding, to July 10th.
1 acre of turnips, 800 bushels.
10 acres of the winter oats lot sown to cowpeas will give of hay 12 tons.
3 acres of rye land planted to sorghum will give green feed to November 1st.
6 acres of the oat hay land planted closely to corn will make stover, 15 tons.

So the fifty acres will yield, in tons, 170; in bushels, 1,600; in summer green feed for 8 months; and yet have ten acres left for a permanent pasture.

The products of the fifty acres, if fed to twenty-five good cows, will produce a huge pile of manure to be returned to the land, and year after year cows may be added, until this will support one cow to each acre.

Should the owner make butter, his account would be about as follows:

RECEIPTS.

7,500 pounds butter sold at 17 cents	$1,275.00
15 calves sold at $3.00	45.00
20 shoats fed on skim milk and corn will make 3,000 pounds of pork, at 8 cents	300.00
	$1,620.00

EXPENSE.

Wages to good helpers	$ 500.00
5 tons wheat bran	120.00
5 tons cotton-seed meal	150.00
	$ 750.00
Gain	$ 870.00
If the farmer's family can do all the work, as is often the case, $500 may be added, thus	500.00
	$1,370.00

which is a pretty fair sum of money; but this will be larger each year as the land becomes more productive and a herd is kept.

If product of the cows is sold as fresh milk, the income would be:

RECEIPTS.

25 cows yield 75,000 quarts of milk, at 2½ cents per quart.....$1,875.00

EXPENSE.

Same as for producing butter..... 370.00

Gain $1,505.00

The cost of care for thirty to thirty-five cows is but little more than for twenty-five; so if the herd has thirty-five cows, the gain would be near to two thousand dollars yer year.

Think over these statements and figures. Doing so may change the plans of some man and be the means of enlarging his income and permitting him to give to his family more comfort and enjoyment than they supposed was their lot in life.

THE CORN CROP: HOW WE MAY HANDLE IT WITH SMALLER COST AND BETTER RETURNS.

By Charles W. Burkett, Professor of Agriculture, North Carolina College of Agriculture.

The corn crop is one of the most important, in influence and value, in the middle South. Its culture and handling are of such great importance that they deserve the first consideration from the hands of our farmers. Corn can be most profitably raised where clover, cowpeas and farm machinery have been a part of the system of corn production. Crimson clover and common red clover are ideal crops to precede the corn crop.

The corn needs a good depth of soil tilth to get the best home for the comfortable living and growing of the roots. In corn culture, then, the two-horse plow is winning its way so as to deepen the soil to eight or ten or twelve inches, thus releasing the locked-up plant food in the soil, and to take care of the moisture down in the subsoil as it comes up, and also to take care of that which falls in the atmosphere as rain. A short rotation involving cowpeas and clover, followed by corn, will not require much of the chemical fertilizers.

DOING AWAY WITH HAND WORK.

If the corn is planted on a level surface, a harrow or a weeder should be used so as to preserve the moisture in the soil, and to destroy the little weeds and grass that first germinate. When the corn is up an inch or so, the same implement can be used again, thus doing away with hand labor. At the College farm we use a two-horse corn planter that distributes the fertilizer and plants two rows of corn at a time. Then we use a harrow, a light one, to go over a couple of times so as to make a thorough mulch and to destroy the weeds and grass that come up. We plant the rows four feet apart and average one stalk to every twelve or sixteen feet.

The cultivator is used then during the remainder of the season four or five times, and in many fields no hand work is done at all. We never thin the corn or sucker it. All the cultivation is of a level and shallow nature. Corn should not be cultivated more than an inch and a half or two inches deep, and never more than three inches in depth, because if a deeper cultivation is given some of the roots are bound to be injured, and thus the corn crop will be cut off and lessened in the end.

The early planted corn is always seeded to cowpeas with the last cultivation. The later planted corn, and especially that planted for ensilage, is not seeded to cowpeas, but left for crimson clover immediately after the cutting of the corn. For crimson clover we do not plow a second time, but simply take a disk harrow, or a spring-tooth harrow, and provide a good seed bed, to seed to clover, which is lightly harrowed in. We use about ten pounds of seed per acre for the clover.

DON'T PULL FODDER.

The age of pulling fodder has past. It has been proved conclusively that it is not only expensive to do so, but at the same time it is a wasteful practice. There is so much feeding value stored away in the butts and stalks of the corn plant that no farmer can afford to waste this, and especially is it important where hay is purchased. It has been found by experience here and in other States that the corn plant shredded will give a feeding stuff almost equal to timothy hay for horses and cattle. Why should we therefore waste half of the corn plant by leaving the stalks and butts in the field to be burned, or otherwise wasted, when we could utilize all of that material for feeding and then return the same to the land in the form of stable manure?

In preparing the corn plant for shredding, we use the following method: A "gallus-hill," or stool, is made from the corn itself. A sufficient number of stalks of corn are pulled over from two rows and tied together to the height of one's waist or shoulder. The tie is made by simply bending the stalks over and lapping the tops and leaves around the stalks, thus making it thoroughly secure and stable. The same end is attained as if we were to drive four stakes in the ground in the form of a square four feet apart. The tops of the stalks readily bend over, and the tops and the leaves can be lapped and entwined within the stalks so as to make it thoroughly secure and able to hold the rest of the corn that is to be set upon the stool thus made.

HARVESTING THE CROP.

We make from twenty-two to twenty-five of these stools for each acre. Then the corn is cut, with a knife or some other implement that can be used in cutting, three or four inches above the top of the ground, and then carried to the stool and set up. If an arm-load is set on each of the four sides of the stool and then tied together with a string or one of the green corn stalks, it will be quite impossible to upset the same by wind or force. A dozen or more of armfuls are then set around each side of the shock, making it round. When this is done the top of the shock should be drawn together by a rope and ring, and closely drawn together, after which the whole shock is tied by binder's twine, or some other form of twine, or even by the green stalks. The shock is set up in armfuls, and the bottom is much larger than the top; so there is

a constant current of air coming up from all directions and circulating throughout the shock, thus insuring a perfect curing of the same. One can make from sixty to one hundred shocks per day through this system of cutting. It means from three to four acres that one man can set up.

Our plan now is to leave the corn in these shocks until it is convenient for shredding and storing. We go on now about our other fall work, sowing clover, putting in rye and wheat, harvesting our fall crops and doing all kinds of work about the farm necessary to be done during the fall months. We have left the corn in the shock until late in January, and found it kept perfectly. There is also an advantage in leaving the corn in the shocks until after it is frozen, for it insures all the cells making up the corn plant to be dead and dried out, so that when the corn is taken to the barn to be shredded it can be stored in the hay-mow or stacked, and we know it will not spoil or mould in any way. The shredding machine husks the corn and blows the shredded stover up in the mow until it is ready to be used. In putting it away we never tramp it, but let it pack itself.

If all of us could feel throughout the State that this is a reasonable and satisfactory method of handling the corn crop, it would mean a saving of thousands and thousands of dollars to our people; it would mean a great saving of feeding stuff to us; it would mean good food for our horses and cattle; it would show that less labor is required from its planting to its harvesting; it would be just one more business principle applied to agricultural practice.

TERRACING AND OTHER MEANS OF PREVENTING LANDS FROM WASHING.

By F. T. Meacham, Superintendent of Statesville Test Farm, North Carolina Department of Agriculture.

This is, to my mind, one of the main subjects pertaining to successful farming in the Piedmont and western sections of North Carolina. Every farmer, whether he owns land or rents it, should have some knowledge of terracing if his lands wash.

What is meant by terracing is the best and proper means of getting rid of surplus rain and surface water on our cultivated fields. What is meant by surplus water is that amount of water that is not soaked up by the top layer of soil, hence finds its way off to the neighboring brook, creek or river.

But those who depend entirely upon ditching and terracing to prevent hillsides from washing will usually be disappointed after a very heavy rain, if there be little or no humus in the soil and a shallow plowed surface to absorb the falling water, consequently allowing the greater part of this water to run off over the surface. The main object we have in terracing is to retain as much of the rain water on the fields as we can, to be used by growing crops in time of drought.

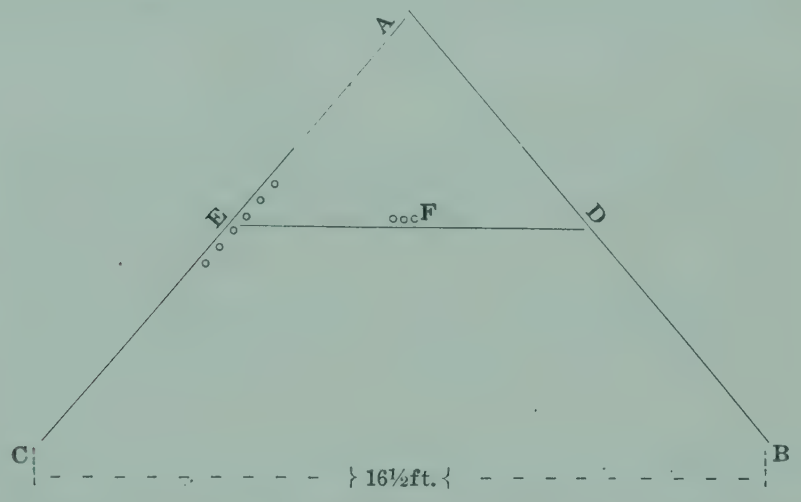
We usually have in North Carolina about 50 to 52 inches of rainfall a year, and if we kept growing crops on our soils all the time we would need for the best results the greater part of this rainfall for the use of these crops.

There are three points which must receive special consideration in the terracing of a farm or field:

1. The amount of water to be carried off.
2. The texture or kind of soil, and lay of the land.
3. The kind of crops to be grown on the fields, whether row crops or broadcast crops.

We cannot lay down any rule for governing this work, for just so many farms to be terraced just so many different conditions have we to contend with, and what is intended in this lecture is to give general principles and outlines of the work, that the farmer may apply these principles to his individual case, if he wishes.

Now, having decided to terrace a field or farm, we naturally want to do this work in the best manner, and do it also as cheaply as possible and not sacrifice the results the work was intended to accomplish. The first thing we do is to get or make a level for laying off the terrace. Below is given a sketch and description of what I think is the best simple device for doing this work. It is known as an A level:



To construct this level, use well-seasoned timber, pine being preferable because it is light and does not tend to warp. Take three pieces 10 feet long, 3 inches wide and ½ inch thick. Now lay on a level floor so as to get our instrument of a rod span. The rod is commonly used in measuring land and is generally best, as it gets over land faster than a ten-foot level. Drive two nails in the floor just a rod, or 16½ feet, apart, saw off the ends of the two pieces to be used for legs, so that the ends will rest flat on the floor. Now place one end of each leg against the nails and let the pieces cross above your head and just exactly over the center of the rod span. Put a bolt here through both pieces to fasten them together at the point A; then we have two legs of the level, AB and AC. Now take the third piece and use as a cross-bar, DE. Fasten the piece DE to AC at about D, bolt so as to permit it to work easily. Now place firmly on DE in the center a spirit level, such as you can get from almost any hardware store for ten cents. Bring DE, at E end, to a point on leg AB where the spirit level indicates level; then mark or put a hole through both for bolt to work in. This hole on AB leg we call zero, which means level.

Now we wish to make a scale that will enable us to run a terrace having a fall anywhere from an inch to four inches. Let some one raise the foot of AB one inch and lower cross-bar DE until level; then put a hole through AB leg, and call this hole No. 1. Now raise foot of AB two inches and put another hole in AB leg and call it No 2, and so on until we make our scale to four or five inches. The half-inch is then gotten by dividing the distance between holes and numbering halves. Now we have an instrument made that should not cost more than fifty cents at the outside, and will, if properly handled, suffice for most of this kind of work.

We are now ready to begin laying off a terrace. Suppose we have a field that has been planted in cotton, or corn, for many years, and begins to need terracing very badly. Suppose this to be a hillside that has a number of old washes started here and there. We, of course, must have an outlet for each terrace. Where a terrace or ditch empties is termed its *mouth*, and where it begins or takes its water is called its *head*. If we have a clay field to terrace we can give it a little more fall than a light loamy or sandy soil. Clay does not wash quite so badly as some other soils, and when properly plowed, say to a depth of ten to twelve inches, will hold in suspension about two inches of rainfall before it is so thoroughly saturated that the water will run off the surface. Sandy land holds only about one inch of rainfall.

Now we can increase the absorbent power of our soils by one-half by incorporating humus or vegetable matter into them.

A soil well supplied with humus and deeply plowed, if kept in broadcast crops, will need but very little terracing. For row crops a terrace should have slightly more fall than where level culture is practiced or broadcast crops are to be grown. In the western section of North Carolina terracing is the only redemption for our red-clay hillsides.

In terracing a field start about three feet from the top of the hill, and begin to lay off the first terrace. Usually about one to two inches fall to the rod will be sufficient. Try to put the second terrace so that it will be about three to four feet lower than the first, and so on down the hill until the whole field is terraced. Now, if a field has a swag about the center and water collects from both directions in this swag, to avoid this begin the terrace in the swag and go both ways, providing there is a good outlet at each end. Lay off the terrace, giving one to two inches fall, as desired, by fastening the cross-bar DE at E in the hole giving the fall desired. Start at the point we have selected to begin, and let the short leg, or the leg with the scale on it, be up-hill. The place for the terrace is found by raising the foot of the instrument up or down hill until the proper level is obtained, then let the boy carrying pegs stick one at the front end of the level; then go with the instrument to that point, and repeat same operation until all the terraces are laid off. When you come to a gulley make half sets with the instrument and set up-grade stakes to tell how high to build the banks to prevent breaking over by heavy rains. Now walk back over the line of stakes and when a place is found where there is too short a turn in the terrace, straighten a little or give a more gentle curve by moving the upper stakes a little down-hill; never move lower stakes up-hill.

Use a large two-horse plow to throw out the terrace; a hillside plow is a very good one to use. Start in with the plow at one end of the terrace, and throw the dirt on the stakes or markers. Turn back at the other end and

throw the next furrow on top of this first furrow, making a "list" or "bed" for the beginning of the terrace. Throw up a bank in this manner for about six furrows on the lower side, and about ten or twelve on the upper side, taking narrow furrow on upper side and throwing the dirt as far over as possible. Now if you can get a land roller, roll this loose dirt tight, that it may be easily plowed again, and repeat the plowing two or three times. Then take a good 10.20-inch reversible disk harrow and throw this dirt in a high ridge with a gentle slope to the bottom. Have enough stock to the machine to pull it fast, for the faster it goes the better it will throw the dirt.

Having made all the terraces in this manner, go over and build up all low places, being sure to build high enough to prevent breaking over in the old washes. From time to time clean out the terraces and throw the dirt that has collected in the low places in the old washes below the terraces, and in a few years all old washes will be filled up and the field present an entirely different appearance.

In stopping old washes, fill with green brush, putting tops up-hill, and cover with enough dirt to weight down; then plow the dirt in on them from both sides, making a ridge on the brush. Now break the field as if no gullies were there, being careful not to tear out the brush. Never fill washes with material that does not decay easily, for it will be in the way of later cultivation.

Now, having the field well terraced, if a row crop is grown, use as much care in laying off rows as in laying off the terraces. If the rows do not break, the terrace is not apt to break. Lay off the first row on the top or ridge of the terrace, and put one on the bank between bottom and top, and one on the bottom. Then lay off the piece of land below the terrace by running the rows with the row on the top of the terrace. When a number of long rows have been laid off with the terrace, they will begin running into the next terrace or "short rows." A good idea is to leave a ten or twelve inch space at the end of each row as a catch for silt before it drops into the terrace. Try to put the rows into the terrace the opposite way to the one the water is going; this helps to retard the flow of water, thus preventing washing out the bottom of the terrace. The bottom of a terrace should be three feet wide and about six feet from bottom to top of ridge.

These terraces may be plowed out every few years when needed. Break the land between terraces as ordinary breaking is done.

Deep plowing, rotation of crops and the working of humus into the soil are important factors in preventing land from surface washing. The old system of using a plumb-bob for getting the fall for the terraces is not accurate enough and is too slow. It is necessary to wait for the string to settle to a scale, and in windy weather this causes a great loss of time.

The Bastrom level is a splendid instrument to get fall for a terrace, but requires more skill in its use than the instrument already described. This Bastrom level is a good instrument to get fall from one terrace to another.

In terracing the greatest care should be exercised, for if it is not properly done it may be worse than not done at all. The same care should be given to the top terrace that is given to the lower ones. If the upper ones do not break, the lower ones are not apt to.

LIVE STOCK IN ITS RELATION TO THE PROSPERITY OF ROCKINGHAM COUNTY.

By A. L. French, at Institute at Wentworth, N. C.

I have been asked to talk upon the subject of *Cattle;* but if you will pardon me I would like to talk along the line of general live stock in its relation to the prosperity of Rockingham County. As I was coming over this morning I made a little mental calculation, and found that our county, with just average farming, could maintain 40,000 head of cattle, with an annual net income of, say, $10 each; an equal number of sheep, capable of producing a net income of $2 each; 20,000 hogs, bringing a net profit of $3 each; 2,000 mule and horse colts at an annual profit of $10 each, and this without reducing your tobacco acreage by one hill. Now, this live stock would mean an annual profit of more than half a million dollars to our farmers, and what would it not mean to our farmers? By careful handling this live stock would manufacture free of cost more than a million loads of stable manure (per year), which, applied at the rate of ten loads per acre, would cover about one-fourth of the agricultural lands of the county, and in the place of barren hills, galls and brush fields, we would have green fields of grass, corn, peas and clover that would be a delight to the owners and all who were privileged to look upon them. But to attain to this very profitable and pleasant state of affairs it will be necessary to change our methods entirely. The brush will have to be cut and burned, gullies filled with brush, grass sown, fields enlarged and shaped up, fences built; in a word, our farmers will have to go to working twelve instead of six months of the year. Silos will have to be built, into which the thousands of tons of corn stalks that are now wasted can be cut and one of the very best feeds for live stock produced in abundance. Our farm lands in a few years would be worth, instead of from three to thirty dollars per acre, twenty to seventy dollars. Wouldn't this pay for the extra exertion and push necessary to accomplish these things?

The profit or loss in the growing of live stock will depend almost entirely on the sort of animals you begin with and the treatment you give them. Don't be content to have a single mean animal on your farm; let every one be of the very best of its kind, for in the handling of this sort only does any profit lie. All the meat-producing animals should be low, broad and blocky, kind and gentle as possible, and they must be given food in quantities sufficient to produce this blockiness. It is absolutely impossible to grow live stock at a profit without the production on the farm of large quantities of the best nutritious foods. Go to any stock-producing country or section and you will find a prosperous people, intelligent, law-abiding, with fine homes, churches and schools and all those things that go to make for good citizenship. Let us have more live stock in old Rockingham.

HINTS ON BUTTER-MAKING.

A discussion of the manufacture of butter properly begins with its source—the cow. Good butter can only be made from good milk, and good milk can only be obtained from cows that are healthy and well cared for.

To the cow and her surroundings, therefore, we must turn our attention. Other than a healthy animal should not be permitted on the premises. In selecting cows preference should be given those animals that conform closest to the dairy type, but they should be put to a further and more satisfactory trial at the pail and the Babcock test. Weigh all the milk from each animal and test it every month for fat content. We should also know how much food each animal consumes, and just how much she gives in return for the food consumed, both as milk and butter. In this way we can act intelligently, selecting our profitable animals and cutting out those profit parasites, the "scrub." When crows pull up our corn and woodchucks get in our clover we feel justified in shooting them. Why should we discriminate in case of the cow, and continue to board her year after year, when the loss is generally many times greater?

A sufficient number of cows should be kept, so that it will pay to devote some time and attention to the business. Also to warrant the purchase of the most approved utensils for the work, for good tools, like good labor, may come a little higher at first, but in the end they are the cheapest and best.

After we have selected a herd of healthy animals it is esential, if we would keep them in good health, that the stable be so constructed as to supply good ventilation and an abundance of light.

Cleanliness is the foundation of the dairy business. Since from eighty-five to ninety per cent of the filth found in the milk comes from the animal during milking, this portion of the work should receive special attention. The animal should be groomed regularly and kept in a clean condition. Why should we pay so much attention to our driving animals and so little attention to the cows that furnish food for our table?

Just before milking, the udder and adjacent parts should be moistened with a damp cloth. This has been found to be very effective in reducing the contamination of milk. The milking should be done with dry, clean hands. The clothes of the milker should also be clean, although that is not generally the practice. As soon as milked the straining should take place. Four thick covers of cheese cloth make a very good strainer. The milk is then ready for separating.

At the present time there are three methods, with slight modification, for separating cream from milk—the shallow-pan system, the deep-setting system and the centrifugal or separator system. Churning whole milk is still practiced by some people, who have only a few cows. This is very wasteful of both time and fat and nearly always results in an inferior quality of butter.

The shallow-pan system is the oldest method of raising cream, but is still used quite extensively. The milk is strained into shallow pans about three or four inches deep, and set away at room temperature and not disturbed for thirty-six hours. The cream is then removed with a thin, flat skimmer.

Following are some of the objections to this system of raising cream: The milk has a large surface exposed to the air, and since a suitable place for setting the milk is seldom provided, cream is often contaminated at this stage. This system requires more room and more labor. At skimming time both the skim milk and cream are sour. Skim-milk from this method of raising cream is seldom found that contains less than eight-tenths of one per cent of fat, showing that this is not an economical way of separating cream.

The deep-setting system is a modification of the one just described. The depth of the milk is increased to about twenty inches, and in order to bring about a rapid cooling of the milk, cans only about ten inches in diameter are used. It is essential, if the best results are to be obtained, that we have the can submerged in ice-water for about twenty-four hours. One objection to this method is that ice is required. Very cold spring-water is often used, but the best results are not obtained.

The deep-setting system has, however, some advantages over the shallow-pan system. The milk being completely submerged, there is less danger of filth gaining an entrance while the cream is rising. It requires less space and less labor. Skim-milk and cream remain sweet. There is only about one-fourth as much fat left in the skim-milk as by the shallow-pan system.

The centrifugal or separator system is considered the most satisfactory method of separating cream from milk. Here are some of its advantages over the systems already described. By this system of separating the cream the milk is not contaminated, but purified and cleaned. The cream remains sweet, and by regulating the cream screw almost any quality of cream can be obtained. The skim-milk is warm and sweet and in the very best condition for feeding purposes. Nearly all the trouble experienced in raising calves on skim-milk can be traced to one of three causes: In regular feeding of too large quantities of milk; feeding cold milk when they have been accustomed to having warm milk, and by feeding sour milk. These troubles would be obviated by using a separator. This system consumes less time, less labor, and makes more butter.

The ripening of the cream is the next step, and a very important one, in the manufacture of butter. It is during the ripening process that those flavors so characteristic of good butter are developed. Undoubtedly the very best results can be obtained by cooling the cream and holding it at a low temperature for several hours immediately after it is separated; then gradually raising the temperature, so as to bring about the required ripeness by the time it is wanted for churning. Another method, that requires less labor and expense, and one that gives very good results, is to keep the cream at a low uniform temperature from the time it is separated until it is ready for churning. Of course no set rules can be given that will apply to all cases, but under our conditions a uniform temperature of 50 to 60 degrees, without the use of a starter, brings about the proper amount of ripeness in cream twenty-four and thirty-six hours old that has been kept well mixed. If cream does not ripen fast enough, the addition of a small amount of sour skim-milk or buttermilk is much to be preferred to raising the ripening temperature. Butter made from cream ripened at a high temperature does not have good body, its texture is poor. This is very important, especially during warm weather, when we want our butter to stand shipping, and make a good appear-

ance on the table. The degree of ripeness that the cream should have is dependent largely upon the taste of the consumer. Some people prefer the taste of butter made from sweet cream, others the acid taste produced from over-ripened cream. Butter of a mildly sweetish taste is made from mediumly ripened cream. Such cream has a thickened, velvety appearance. When cream is ripened to the point when the whey begins to separate, there is danger of a rancid and strong-flavored butter, and unless care is taken in straining the cream, there is danger of white flecks in the butter.

Churns without any floats or other contrivances inside the churn give the best results—such as the box, barrel and swing churns. The ripened cream should be put into the churn at about 58 degrees in summer and 60 degrees in winter. Now, that does not mean 65 degrees to 70 degrees. A difference of a few degrees in the churning temperature not only means a loss of fat, but a poor quality of butter, and there is no pride or profit in the making of such butter. If there is one thing more than another that we would impress upon our readers, it is this: that, outside of cleanliness, there is nothing about the care of cream and the making of butter that will have as much influence on the results as a proper regard of temperatures. Guess-work should no longer be tolerated in dairying, it belongs to another day. A thermometer costs only a trifle, and when properly used, and coupled with an attractive package for our butter, means anywhere from five to fifteen cents more a pound than the general market price. If conditions are as they should be, the churning should take about thirty minutes. Difficulty in churning can usually be traced to some of these causes: Cows nearly dry, or fed almost exclusively on dry food; churn filled too full, and the temperature too low. An extremely high temperature will also cause trouble. The first two mentioned can be helped by feeding green, succulent food, introducing fresh cows, and causing a vigorous souring of the cream. Having the churn so full that there is not enough space left for concussion is a very common trouble, and one, of course, that can be easily remedied. There is probably more trouble caused by not having the proper temperature than from all other causes combined. It is necessary that a thermometer be used if good butter is to be made. When people boast about churning in about five minutes, you may make up your mind as to the quality of butter produced, and that the hogs get their share of the butter. The churning should stop when the butter grains are quite small, then the buttermilk can be more thoroughly removed. After the butter has been drained free of the buttermilk, it should be washed in two changes of cold water, the temperature depending upon the season. Butter should not be allowed to stand in cold water. After draining, the butter should be weighed and spread out evenly on a butter-worker. It should still be in that finely divided condition. Three-quarters of an ounce of salt to the pound should be sifted evenly over its surface.

When butter is made as directed above, there is no buttermilk to be removed. The working of such butter is simply to thoroughly incorporate the salt. Insufficient working is the cause of streaked butter. If trouble of this kind occurs, working the butter a second time will generally remove it.

The butter should be put up in a neat, attractive package. The stamp should be distinctive, having name, initials or some original design on it to serve as a trade-mark. Be sure that every pound of butter bearing that stamp is up to the standard, and have that standard high.

There is always a demand for good butter at good prices. Every one wants good butter. No one wants poor butter at any price. Learn to produce good butter. Never produce any other. Let your stamp be a guarantee of the contents of every package. Use business methods, advertise, encourage inspection of your dairy and methods of handling your products. If these things are done in an intelligent manner, the dairyman will receive his full share of the wealth, pride and prosperity that go so far towards making up a happy, contented life.

SECOND REPORT ON FEEDING STUFF INSPECTION.

By B. W. Kilgore, C. D. Harris, J. M. Pickel, W. M. Allen.

Concentrated feeding stuffs are as much subject to adulteration as are commercial fertilizers. At the present time they are adulterated with materials having but little feeding value, such as the chaff of the grains, oat hulls, peanut hulls, corn bran, screenings, corn cobs, oat dust, sweepings, cotton-seed hulls, coffee hulls, etc., to a greater extent than commercial fertilizers. They are used very largely for feeding domestic animals, particularly milk cows, of which there are about 250,000 in the State. The feeding value of these products depends on their composition, and may be varied by the use of the materials referred to above, so as to change their value as feed to a very marked extent. To prevent such adulteration and to require manufacturers to guarantee and keep their products up to a certain standard, the General Assembly of 1903 passed laws regulating the manufacture and sale of concentrated commercial feeding stuffs and cotton-seed meal. These laws went into effect on July 1, 1903, and are reproduced in full below for the information and benefit of those who are interested in them:

AN ACT TO REGULATE THE SALE OF CONCENTRATED COMMERCIAL FEEDING STUFFS.

The General Assembly of North Carolina do enact:

Section 1. That every lot or parcel of concentrated commercial feeding stuff, as defined in section three of this act, used for feeding domestic animals or poultry, sold, offered or exposed for sale within this State, shall have affixed thereto, or printed on the bag or other package, in a conspicuous place on the outside thereof, a legible and plainly printed statement, clearly and truly certifying the number of net pounds of feeding stuff contained therein, the name, brand or trade-mark under which the article is sold, the name and address of the manufacturer, importer or jobber, and a statement of the maximum percentage it contains of crude fiber, and the minimum percentage of crude fat and of crude protein, allowing one per cent of nitrogen to equal six and one-fourth per cent of protein, all three constituents to be determined by the methods in use at the time by the Association of Agricultural Chemists of the United States.

Sec. 2. The term "concentrated commercial feeding stuff," as herein used, shall not include hays and straws, the whole seeds, nor the unmixed meals made directly from the entire seed of wheat, rye, barley, oats, Indian corn, buckwheat, broom corn, sorghum, cowpeas or soja beans. Neither shall it include pure grains ground together, nor wheat bran or wheat middlings, not mixed with other substances, but sold separately as distinct articles of commerce, nor the by-product (not corn bran alone, but the bran, portions of the germ and grain mixed) from the grinding of corn for meal, grits or hominy, when said by-product shall come up to the standard adopted by the Board of Agriculture; but should the whole grains, the unmixed meals, grains ground together, wheat bran, wheat middlings, or corn by-product be adulterated, they shall be subject to the provisions of this act.

Sec. 3. The term "concentrated commercial feeding stuff" as herein used shall include linseed meals, cocoanut meals, gluten feeds, maize feeds, starch

Note.—The photographs from which the cuts were made were taken by H. Harold Hume and C. D. Harris.

feeds, sugar feeds, dried brewers' grains, malt sprouts, dried distillers' grains, dried beet refuse, hominy feeds, cerealine feeds, rice meals, peanut meals, oat feeds, corn bran, ground beef or fish scraps, mixed feeds, clover meal, and all materials of a similar nature not included in section two of this act.

SEC. 4. Each and every manufacturer, importer, jobber, agent or seller, before selling, offering or exposing for sale in this State any concentrated commercial feeding stuff, as defined in section three of this act, shall for each and every feeding stuff bearing a distinguishing name or trade-mark file with the Commissioner of Agriculture a copy of the statement named in section one of this act, and accompany said statement, when so requested by the Commissioner of Agriculture, by a sealed glass jar or bottle containing at least one pound of the feeding stuff to be sold, exposed or offered for sale, which sample shall correspond, within reasonable limits, to the feeding stuff which it represents, in the percentages of protein, fat and fiber which it contains.

SEC. 5. Each and every manufacturer, importer, jobber, agent or seller of any concentrated commercial feeding stuff as defined in section three of this act shall pay to the Commissioner of Agriculture an inspection tax of twenty cents per ton for each ton of such concentrated feeding stuff sold, offered or exposed for sale in the State, and shall affix to each car shipped in bulk, and to each bag, barrel or other package of such concentrated feeding stuff a tag, to be furnished by the said Commissioner of Agriculture, stating that all charges specified in this section have been paid. The Commissioner of Agriculture is hereby empowered to prescribe the form for such tags, and the Board of Agriculture is empowered to adopt standards for concentrated feeding stuffs and such regulations as may be necessary for the enforcement of this law, the violation of any of which regulations shall be a misdemeanor. Whenever a manufacturer, importer or jobber of a concentrated feeding stuff shall have filed the statement named in section one of this act, and paid the inspection tax, no agent or seller of said manufacturer, importer or jobber shall be required to file such statement or pay such tax.

SEC. 6. Any manufacturer, importer, jobber, agent or seller who shall sell, offer or expose for sale or distribution in this State any concentrated commercial feeding stuff as defined in section three of this act, without complying with the requirements of the preceding sections of this act, or who shall sell, or offer or expose for sale or distribution any concentrated commercial feeding stuff which contains substantially a smaller percentage of constituents than are certified to be contained, or who shall adulterate any feeding stuff with foreign mineral or other substance or substances, with substances injurious to the health of domestic animals, shall be guilty of a misdemeanor, and shall be fined not exceeding $50 for each offense, and the lot of feeding stuff in question shall, in addition, be subject to seizure, condemnation and sale by the Commissioner of Agriculture, as prescribed for the seizure, condemnation and sale of commercial fertilizers in this State. Fines and the proceeds from sales under seizures shall be covered into the State treasury for the use of the Department of Agriculture in executing the provisions of this act.

SEC. 7. The Commissioner of Agriculture is hereby authorized to have collected a sample not exceeding two pounds in weight, for analysis, from any lot, parcel or package of concentrated commercial feeding stuff as defined by section three of this act, or unmixed meals, ground grains, wheat bran, wheat middlings or corn by-product, named in section two of this act, which may be in the possession of any manufacturer, importer, agent or dealer, but said sample shall be taken from not less than ten per cent of the whole lot inspected. One or more samples of each feeding stuff collected as herein provided shall be analyzed annually by the State Chemist and his assistants, and the results published in THE BULLETIN, together with such additional information in relation to the character, composition and use thereof as may seem to be of importance.

SEC. 8. Any manufacturer, dealer or other person who shall impede, obstruct, hinder or otherwise prevent or attempt to prevent any inspector or other person in the performance of his duty in collecting samples, or otherwise in connection with this act, shall be guilty of a misdemeanor, and shall, upon conviction, be fined not less than ten dollars nor more than fifty dollars.

SEC. 9. The Commissioner of Agriculture, upon ascertaining any violation of this act for the first time, shall forthwith notify the manufacturers, importers or sellers in writing, giving them not less than thirty days therefrom in which to comply with the requirements of this act. In case of the second or subsequent violation by the same party or parties, or in case after a lapse of thirty days the requirements of this act remain still uncomplied with, it shall be the duty of the Commissioner of Agriculture to enforce the provisions of this act: *Provided, however*, that there shall be no prosecution in relation to the quality of any concentrated commercial feeding stuff, if the same shall be found to be substantially equivalent to the statement of analysis made by the manufacturers, importers or dealers.

SEC. 10. Magistrates and justices of the peace throughout this State shall have jurisdiction to hear and determine actions arising from violation of the provisions of this act, and to hold for court or impose the penalties prescribed therein, subject to appeal as the law may direct.

SEC. 11. This act shall be in force from and after July 1, 1903.

In the General Assembly read three times, and ratified this 2d day of March, A. D. 1903.

AN ACT TO REGULATE THE SALE, INSPECTION AND BRANDING OF COTTON-SEED MEAL.

The General Assembly of North Carolina do enact:

SECTION 1. That all cotton-seed meal sold for use as fertilizer or feed shall be subject to an inspection tax of twenty cents per ton, and be subject to inspection, as other fertilizers or fertilizing materials, unless sold to manufacturers for use in manufacturing fertilizers.

SEC. 2. That all cotton-seed meal offered for sale, unless sold to manufacturers for use in manufacturing fertilizers, shall have plainly branded on the bag containing it, or on the tag attached thereto, the following data:

1—Cotton-seed meal.

2—Weight of package.

3—Ammonia or nitrogen.

4—Name and address of manufacturer.

SEC. 3. That no person or persons, firm or corporation shall offer for sale any cotton-seed meal, except as provided in section two of this act, with a minimum per cent of ammonia less than 7½ per cent.

SEC. 4. That the State Board of Agriculture is empowered and directed to make such rules and regulations as are necessary to a proper carrying into effect the provisions of this act, and to provide for all such tags as manufacturers may demand, upon paying the tax therefor. Any person willfully violating any of the regulations made by the Board of Agriculture in connection with this act shall be guilty of a misdemeanor.

SEC. 5. That any person or persons, firm or corporation violating any of the provisions of this act shall be guilty of a misdemeanor, and upon conviction shall be fined or imprisoned, or both, at the discretion of the court.

SEC. 6. That this act shall be in force from and after July 1, 1903.

In the General Assembly read three times, and ratified this 3d day of March, A. D. 1903.

These laws were passed because of the large amount of adulteration of the materials covered by them in the past, as ascertained by the analyses of this Department, and at the suggestion generally of farmers, and particularly of the millers and cotton-seed meal manufacturers of the State, committees from the Millers' Association and Cotton-seed Oil Mill Association appearing before committees of the Legislature for this purpose.

DEFINITIONS AND DESCRIPTIONS OF PRODUCTS.

The name commercial feeding stuff, or concentrated commercial feeding stuff, is usually applied to a class of substances which, in a majority of cases, are the by-products of other branches of industry. Some of these articles, as brans, middlings and cotton-seed meal, have been the daily diet of domestic animals for many years. These products are mainly as follows:

FROM WHEAT.

Bran.—This consists of the outer portion of the wheat grain, and, though somewhat rich in indigestible fiber, is a valuable feed because of its protein and fat content. It is also rich in phosphates and potash salts.

Shorts and Middlings.—In the feeding-stuff trade these two products are frequently the same and are the more inner coatings of the wheat grain, and are made up of smaller fragments, together with portions of the more starchy part of the wheat grain.

Wheat Germ consists of the embryo of the wheat grain. It is rich in oil and protein.

FROM CORN.

Maize or Corn Bran is the outer husk or coating of the corn grain. It is high in fiber and of low feeding value.

Gluten Meal is the more nitrogenous portion of the corn grain which lies just below the husk. It is what is left after the bran, germ and starch are taken from the grain in the manufacture of starch.

Germ Meal or Cake is the nitrogenous and fatty residue left after extracting the oil from the germ of corn. It is very digestible and an excellent feed.

Corn Cobs consist largely of woody fiber and consequently have low feeding value. When corn has not fully ripened more nutriment remains in the cob, as it is not then so hard and woody. Cobs, when ground with the grain belonging to them, are not objectionable, but rather improve the feed for cattle and horses.

Corn and Cob Meal.—Frequently corn, together with the cob which bears it, are crushed together at the same operation, the resultant product being called corn and cob meal. It is a good feed when well ground.

FROM RICE.

Rice Meal or Bran is the outer layers of the rice grain, together with portions of the germ. They are rich in nitrogenous matter (protein) and fat, and are high in percentage of ash, or mineral matter.

Rice Polish is a fine powder and is a still more highly nitrogenous feed than the meal or bran, as a rule.

FROM OATS.

Oats are almost entirely employed whole or crushed as a feed stuff. The by-products from the manufacture of oat meal are comparatively worthless; the husk or hull, which is the main part of this by-product, being mainly woody fiber and therefore of but little feeding value.

FROM BARLEY.

Malt Sprouts.—Malt is produced by soaking barley in water and allowing it to germinate until the shoots attain a certain length. The malt is then kiln-dried and the shoots broken off. These dried shoots are called malt sprouts and are rich in protein and mineral matter. They are good feed for pigs and cattle.

Dried Brewers' Grains consist of the residue left after "mashing" the malt, whereby the greater portion of the carbohydrates are converted into sugar and removed. They are largely employed locally as feed for dairy cows. The grains direct from the breweries contain too much water and are too liable to change to permit of their being used except in the immediate vicinity of breweries. When dried they are a valuable feed and are sold under the name of dried brewers' grains.

FROM PEANUTS.

Peanut Cake or Meal is the residue from the extraction of oil from the peanut kernel. It is a very valuable concentrated feed, being rich in both protein and fat. This product, as well as other concentrated feeds, is not infrequently adulterated by grinding with it peanut shells.

FROM FLAXSEED.

Flaxseed Meal or Linseed Meal are names given to ground flaxseed from which most of the oil has been removed.

FROM COTTON SEED.

Cotton-seed Meal is the ground residue from the extraction of cotton-seed oil from the cotton-seed kernels. Cotton-seed meal of standard grade in this State must contain 7½ per cent of ammonia, which is equal to 38.62 per cent protein. Higher grade meals contain forty and more per cent. When of good quality there is no better feed on our markets for beef cattle and milk cows. Cotton-seed meal is sometimes adulterated with cotton-seed hulls. Occasionally cotton-seed meal from Sea Island cotton seed comes on our market. It is never as valuable as the meal from our upland cotton seed, because it is impossible to separate the hulls from it. It usually has one-half to two-thirds the feeding value of good upland meal.

CLASSIFICATION AND VALUE OF FEEDING STUFFS.

Feeding stuffs may be classified as follows:

No. 1.	No. 2.	No. 3.	No. 4.
Very high in Protein—above 40 per cent.	Rich in Protein—25 to 40 per cent.	Fairly rich in Protein—12 to 25 per cent	Poor in Protein—below 12 per cent.
Cotton-seed Meal. Dried Blood. Meat Scraps.	Linseed Meal. Gluten Meal. Soja Beans. Buckwheat Middlings.	Wheat Shorts. Wheat Bran. Wheat Middlings. Cowpeas. Pea Meal. Oat Shorts. Rye Shorts. Gluten Feed.	Rice Polish. Hominy Chops. Wheat. Oats. Rye. Rice. Corn. Hays, Stover, etc.

With all classes of feeds high percentages of protein and fat indicate high feeding value. This is well illustrated in cotton-seed meal, linseed meal, soja beans and similar feeds. High percentages of fiber, on the other hand, go with materials having comparatively low feeding value. The farmer, in buying concentrated feeds, should have these facts clearly in mind. He usually buys concentrated feeds to supplement the coarse products, like corn stover and the hays, raised on the farm. It is largely protein that he needs, and there is no economy in purchasing feeds low in protein. The analyses presented in this BULLETIN show that where the materials have 5 to 10 or even 12 per cent of protein there are, as a rule, also large quantities of fiber, which means that the by-product is the coarse, chaffy part of the grains, or else these materials have been ground with the other products. Of two feeds having an equal amount of protein, the one which has the smallest amount of fiber is the more valuable, and the farmer will not go far astray if he values the concentrated feed which he purchases in proportion to its content of protein and fat. Except at extremely low figures it is doubtful if it will pay any one to purchase concentrated feeds containing less than 8 to 10 per cent of protein, and when they go below these figures they should be looked upon with suspicion.

INSPECTION OF FEEDS DURING 1904.

During the spring and summer of 1904 the Feed Inspectors of the Department visited many towns and villages of the State and collected five hundred samples of feeds.

A majority of the samples were examined microscopically in the towns in which they were found, and if found adulterated or misbranded, were withdrawn from sale.

It is very necessary that the different kinds of feeds should be examined just where they are found, in order that the sale of those adulterated may be immediately prohibited. This plan has been followed and many shipments of adulterated feeds into the State have been found and their sale forbidden.

This is the second BULLETIN under the Concentrated Feeding Stuff Law. Since the passage of the law frequent inspections have been made in all parts of the State, and the manufacturers, jobbers, dealers and consumers have been informed as to the provisions of the law, and generally are complying with it.

The Department in executing the law has endeavored to be of service to manufacturers, dealers and consumers, and wishes the co-operation of all, in order that the efficiency of the work may be increased and its scope extended.

KINDS AND NUMBER OF SAMPLES ANALYZED.

Wheat Bran	85
Wheat Middlings	50
Ship Stuff	116
Corn and Oat Feed	35
Rice Feeds	20
Peanut Feeds	8
Saccharine Feeds	6
Gluten Feeds	5
Chops	6
Distillery Grains	2

Hominy Meal or Feeds	4
Corn and Cob Feeds	5
Linseed Meal	4
Cotton-seed Feeds	8
Cotton-seed Meal	85
Miscellaneous	61
Total	500

SAMPLES OF FEEDING STUFFS EXAMINED IN 1904.

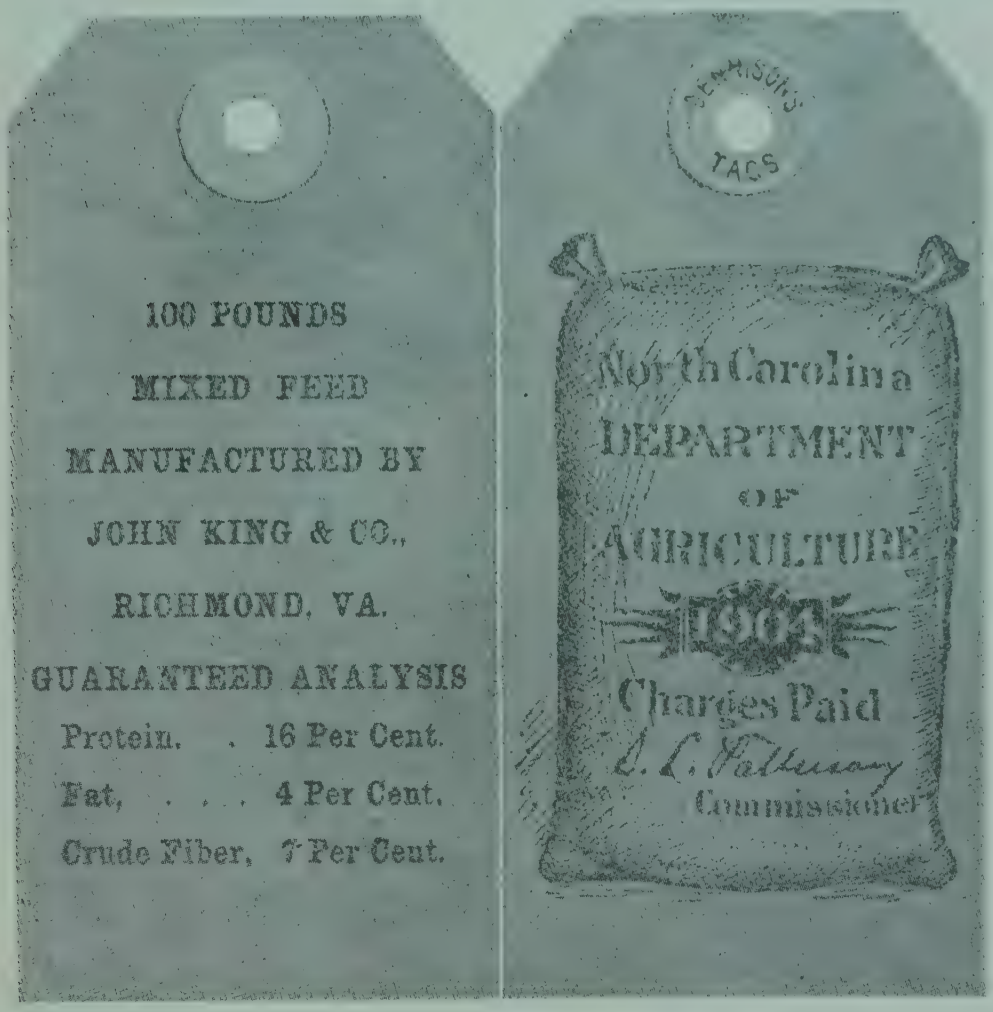
Five hundred samples (500) of feeding stuffs and cotton-seed meals were collected by the Inspectors of the Department or sent in by individuals and analyzed chemically and microscopically during 1904.

The samples were obtained in the number indicated from the following towns in the State:

Raleigh	25	Sanford	1
High Point	7	Rockingham	2
Thomasville	5	Wadesboro	3
Lexington	2	Lumberton	7
Salisbury	12	Fayetteville	3
Concord	4	Plymouth	3
Fair Grove	1	Hertford	2
Charlotte	15	Connelly Springs	1
Greenville	4	Nashville	1
Washington	7	Cherryville	1
Edenton	6	Wakefield	1
Elizabeth City	15	Biltmore	2
Weldon	1	Battleboro	6
Henderson	18	Scotland Neck	4
Oxford	12	La Grange	1
Durham	21	Franklinton	5
Dennis	2	Dickerson	1
Greensboro	9	Cary	4
Elmwood	1	Leaksville	1
Smithfield	3	Spray	1
Selma	5	Reidsville	8
Maxton	3	New Bern	10
Gastonia	3	Newton	2
Shelby	1	Hickory	4
Laurinburg	7	Asheville	10
Madison	3	Murphy	3
Dunn	4	Hendersonville	4
Morganton	5	Marion	1
Apex	1	Waynesville	3
Southern Pines	5	Rural Hall	2
Mt. Airy	10	Aberdeen	2
Elkin	3	Rutherfordton	1
North Wilkesboro	13	Marshall	1
Winston-Salem	9	Hildebran	1
Wilmington	21	Statesville	3
Kinston	7	Laurinburg	4
Goldsboro	14	Clayton	7
Wilson	13	Williamston	2
Rocky Mount	7	Miscellaneous	72
Tarboro	8		
Troy	2	Total	500

BRANDING OF FEEDING STUFFS.

The guarantee should take the form indicated on the tag in the cut below. This guarantee may be printed on the bag or on a tag attached to the bag, or on both.



All feeds that bear a guaranteed analysis must be kept up to that guarantee. The consumer should see that the feed is properly tagged before purchasing. He should also see that the feed contains the feeding constituents he is in need of for the purpose he is going to feed.

Since the law went into effect there has been a marked decrease in the adulteration of feeds, the majority of manufacturers making their products come up to what is claimed for them. There is, however, a tendency on the part of some manufacturers to disregard the law and ship inferior goods into the State.

THE USES OF ANALYSES OF FEEDING STUFFS.

1. They show the composition of the feed.
2. Whether or not it is adulterated, and if adulterated the form of adulteration.
3. Whether or not the feed is up to the guarantee claimed for it.
4. They furnish data for the dairyman and stock-raiser to calculate and compound rations.

ANALYSES OF SAMPLES OF CONCENTRATED FEEDING STUFFS, SEASON 1904.

On the following pages will be found the results of the chemical and microscopic examinations of the samples of concentrated stock feeds collected by the Inspectors of the Department, and those sent in by farmers, dealers and manufacturers. These analyses, with the discussion of the results which follow them, are deserving of careful consideration on the part of all local dealers and also feeders.

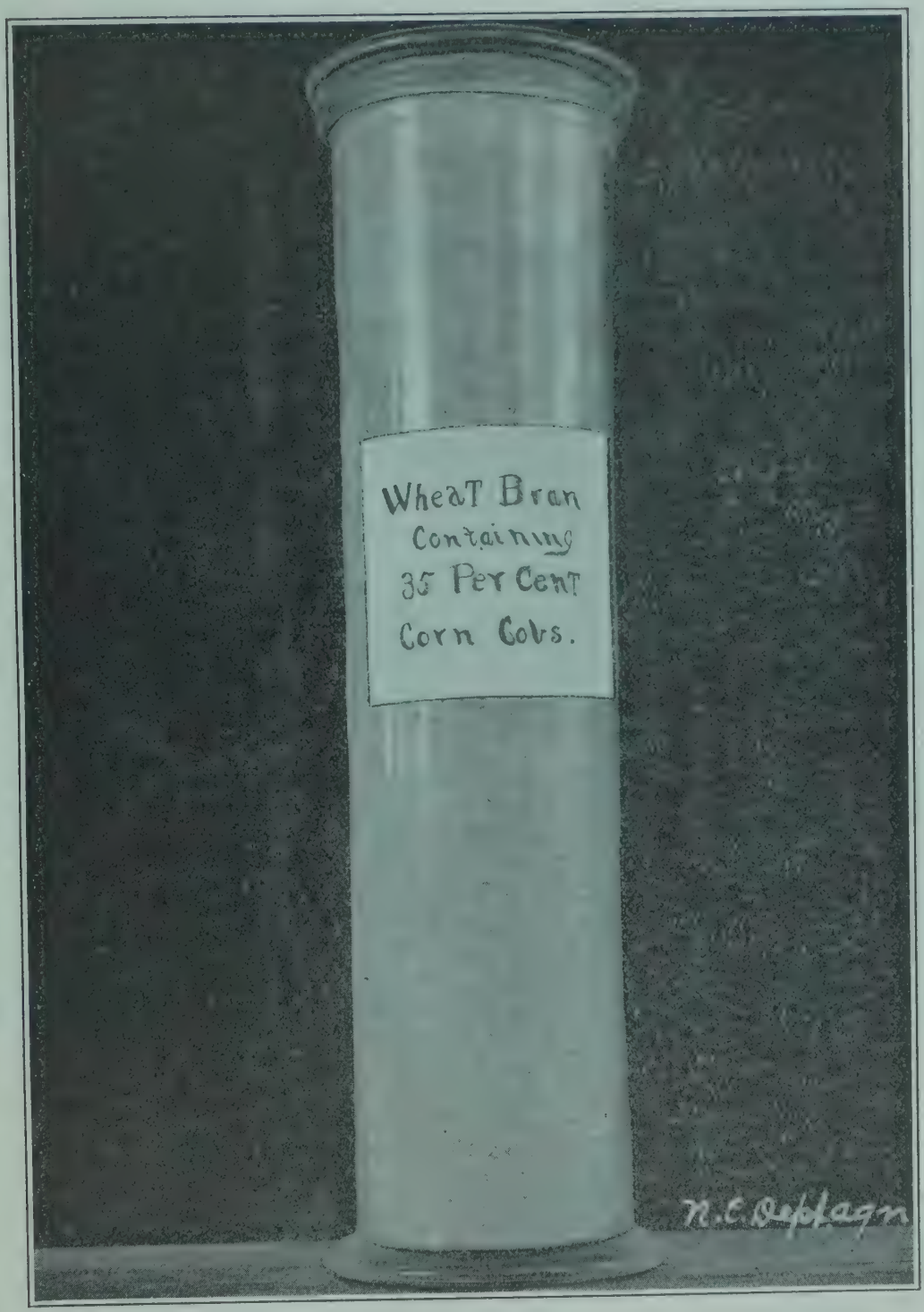


PLATE XIII.

A SAMPLE OF FEED FOUND ON SALE IN THE STATE.

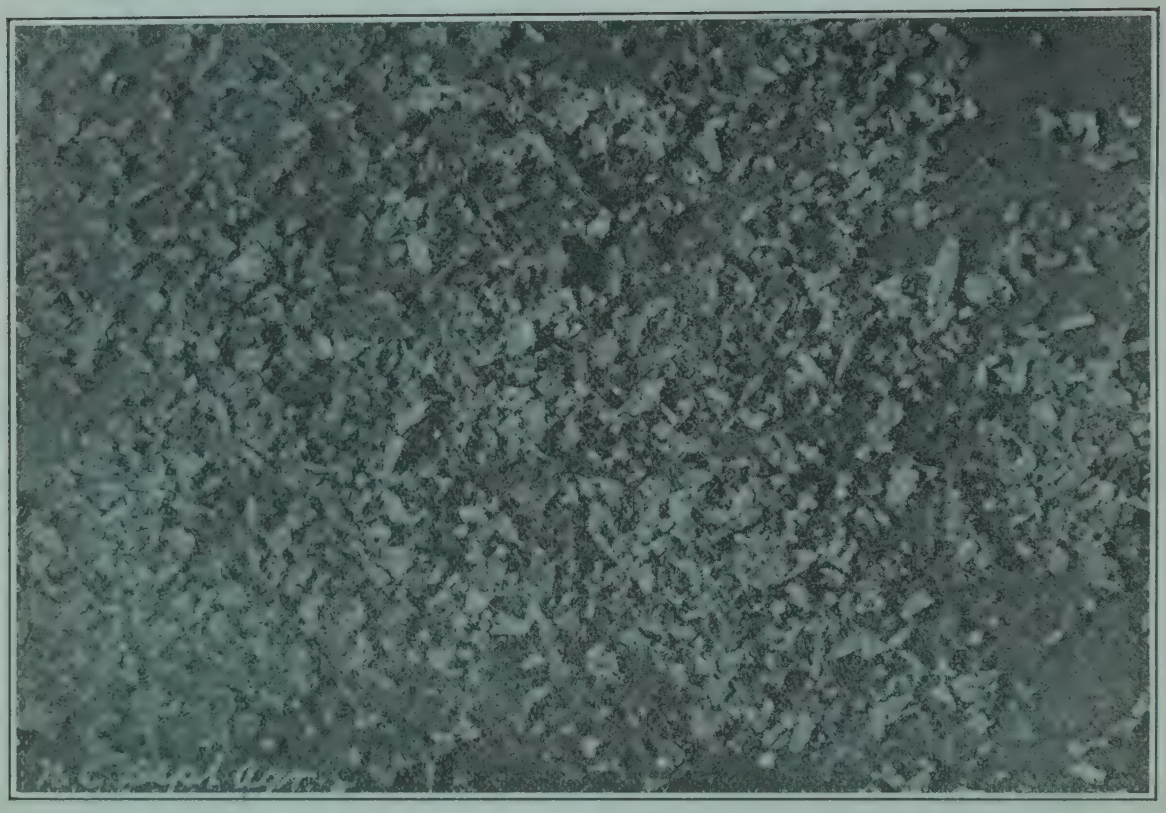


PLATE I.

WHEAT BRAN CONTAINING CORN COBS, AS IT APPEARS TO THE NAKED EYE.

PLATE II.

WHEAT BRAN CONTAINING CORN COBS, AS IT APPEARS WHEN MAGNIFIED SEVEN TIMES.

Fig. 1 shows the corn cobs. Fig. 2 shows wheat bran.

WHEAT BRAN.

Wheat bran is the by-product from the manufacture of flour. It carries a considerable amount of crude fiber, somewhat resembling straw in this par-

RESULTS OF THE EX

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
113	Bran	Adams Grain and Provision Co., Charlotte, N. C.		
13	----do	Asheville Milling Co., Asheville, N. C.	Finch & Son, Lexington, N. C.	Jan. 8
44	----do	----do	Forney & Co., Morganton, N. C.	Jan. 15
45	Pure Wheat Bran	----do	A. F. Summers & Co., Morganton, N. C.	Jan. 15
47	Bran	----do		Feb. 1
49	----do	----do		
197	----do	----do	W. F. Ferrall & Bro., Durham, N. C.	Mar. 18
240	----do	----do	O. M. Boyd, Gastonia, N. C.	April 5
375	----do	----do	John R. Proctor, Durham, N.C.	April 19
405	----do	----do	Hamell Bros., Oxford, N. C.	July 20
140	----do	Atlanta Milling Co., Atlanta, Ga.	McNair & Pearsall, Wilmington, N. C.	Mar. 4
35	----do	----do		
50	----do	----do		
62	----do	----do	Wilson Mercantile Co., Hendersonville, N. C.	Jan. 23
137	----do	----do	D. L. Gore Co., Wilmington, N. C.	Mar. 4
174	----do	----do	Southern Grocery Co., Henderson, N. C.	Mar. 17
222	----do	Atlanta Milling Co., Atlanta, Ga.	John L. McEachern, Wilmington, N. C.	Mar. 24
270	----do	----do	C. B. Grant, Southern Pines, N. C.	April 29
355	----do	----do	R. B. Powell, Henderson, N. C.	April 16
402	----do	----do	Klutz & Randleman, Salisbury, N. C.	June 22
409	----do	Augusta Milling and Mercantile Co., Massey Creek, Va.	F. R. Gray & Bro., Cary, N. C.	
189	----do	Ballard & Ballard, Louisville, Ky.	J. S. Bivens, Oxford, N. C.	Mar. 17
297	----do	----do	J. W. Brown, Edenton, N. C.	Mar. 10
389	----do	----do	M. M. Sheppard, Hendersonville, N. C	June 27
201	----do	Carrolina Roller Mills, Durham, N. C.	Carrolina Roller Mills, Durham, N. C.	Mar. 18
195	----do	----do	Carpenter, Robeson & Co., Durham, N. C.	Mar. 18
437	----do	City Grain and Feed Co., Greenville, Tenn.	Adams Grain and Provision Co., Charlotte, N. C.	Aug. 10
58	----do	Clyde Roller Mills, Clyde, N. C.		Feb. 10
180	----do	M. Collins (broker), Henderson, N. C.	Burroughs & Coleman, Henderson, N. C.	Mar. 17
158	----do	Cumberland Mills, Nashville, Tenn.	R. B. Peters Grocery Co, Tarboro, N. C.	Mar. 9
157	----do	----do	Oates & Liles, Tarboro, N. C.	Mar. 9
350	----do	Dan Valley Mills, Danville, Va.	Davis & Watkins Co., Henderson, N. C.	April 16

ticular. It differs from straw, however, in that the inner surface of the bran flakes is made up of the nutritious layer of the wheat grain, which is rich in protein and fat. To be of good quality it should contain 15½ per cent protein.

AMINATION OF BRAN.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$-----	------	------	------	------	------	14.50	3.91	8.09	5.95	Wheat bran, containing some corn bran.
1.12	100	------	------	------	------	12.69	4.03	6.91	4.51	Wheat bran and corn bran.
1.00	75	------	------	------	------	12.88	4.70	8.55	5.16	do.
1.75	75	------	------	------	------	14.88	3.86	8.43	4.59	do.
------	------	------	------	------	------	16.37	3.84	8.87	5.29	do.
------	------	------	------	------	------	16.96	4.29	6.97	5.05	do.
1.25	100	15.00	3.00	9.5	------	12.63	4.28	7.93	4.77	Wheat bran and corn bran mixed, also contains some whole grains of corn.
------	75	15.00	3.00	9.5	------	13.63	4.69	7.91	4.47	Wheat bran and corn bran.
1.30	100	15.00	3.00	9.5	------	------	------	------	------	Wheat bran, cracked corn, corn bran, and whole wheat.
1.10	75	------	------	------	------	13.87	4.22	8.30	------	Wheat bran and corn bran.
1.10	100	------	------	------	------	11.13	2.96	17.53	12.26	Wheat bran and rice chaff.
------	------	------	------	------	------	10.62	2.70	21.10	9.71	Wheat bran, rice chaff and some corn product.
------	------	------	------	------	------	14.12	3.85	12.12	7.25	do.
.95	75	------	------	------	------	9.63	3.80	18.42	10.34	Wheat bran and rice chaff.
------	100	------	------	------	------	10.17	2.80	20.57	1.49	do.
1.30	100	------	------	------	------	------	------	------	------	Wheat bran, rice chaff and corn product.
------	------	------	------	------	------	12.87	4.08	7.96	5.95	Wheat bran, corn product and some rice chaff.
------	------	------	------	------	------	12.87	2.15	14.73	8.12	Wheat bran and rice chaff.
------	100	10.00	2.50	9.00	------	10.37	3.85	14.23	------	do.
------	100	10.00	2.50	9.00	------	9.25	2.56	27.36	------	do.
------	------	------	------	------	------	14.62	4.30	11.70	7.52	Wheat bran.
1.35	100	------	------	------	------	15.25	4.86	8.92	6.57	do.
------	100	------	------	------	------	16.37	4.00	6.13	7.55	do.
------	100	------	------	------	------	18.12	5.00	9.08	7.03	All wheat product.
1.25	100	------	------	------	------	15.75	3.75	10.20	7.79	Pure wheat bran.
1.30	100	------	------	------	------	15.00	4.28	9.76	6.66	do.
------	100	------	------	------	------	12.25	3.85	14.21	4.33	Wheat bran and ground corn cobs.
------	------	------	------	------	------	13.75	5.12	6.80	4.55	Wheat bran and corn bran.
------	------	------	------	------	------	11.13	3.30	13.90	7.59	Wheat bran, corn bran and oat chaff.
------	100	------	------	------	------	14.75	4.60	8.77	6.61	All wheat bran.
1.35	100	------	------	------	------	15.38	4.14	7.32	6.56	do.
1.35	100	------	------	------	------	13.75	4.19	8.50	------	do.

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
186	Bran	Dahuke Walker Milling Co., Union City, Tenn.	R. W. Price, Wilmington, N. C.	----------
203	----do	----do	----do	Mar. 9
220	----do	----do		Mar. 25
221	----do	----do	John S. McEachern, Wilmington, N. C.	Mar. 25
285	----do	----do	Worth Co., Wilmington, N. C.	May 7
393	----do	Douglas Mills, Nashville, Tenn.	J. T. Jameson, Charlotte, N. C.	June 20
161	----do	Dunlop Mills, Richmond, Va.	J. Havens, Washington, N. C.	Mar. 11
293	----do	----do	----do	May 5
345	----do	----do	Savage & Tunstall, Greenville, N. C.	May 4
344	----do	----do	D. Lichtenstein, Tarboro, N. C.	May 13
150	----do	Etowah Milling Co., Cartersville, Ga.	Wilson Grocery Co., Wilson, N. C.	Mar. 8
32	----do	Farmers Milling Co., Conover, N. C.		----------
38	----do	----do	Warlick Grocery Co., Newton, N. C.	Jan. 14
339	----do	J. M. Gwaltney, Norfolk, Va.	Jennette Bros. Co., Elizabeth City, N. C.	May 11
126	----do	Granite Roller Mills, Mt. Airy, N. C.		----------
193	----do	Holliday Milling Co., Cairo, Ill.	J. G. Rogers & Co., Durham, N. C.	Mar. 18
212	----do	Harrisonburg Milling Co., Harrisonburg, Va.	W. A. Myatt, Raleigh, N. C.	Mar. 21
374	----do	Hickory Milling Co., Hickory, N. C.	J. W. Harris & Co., Durham, N. C.	May 19
210	----do	----do	Hunter & Dunn, Raleigh, N. C.	Mar. 21
151	----do	Huff, Andrews & Moyler Co., Roanoke, Va.	Hales & Edwards, Rocky Mount, N. C.	Mar. 9
213	----do	S. C. Hurt & Son, Lynchburg, Va.	Sockwell Bros., Greensboro, N. C.	Mar. 24
298	----do	Jesse Jones & Son (jobbers), Norfolk, Va.	T. C. Blanchard & Bros., Hertford, N. C.	May 5
226	----do	C. H. Lentz, Elmwood, N. C.		April 10
424	----do	Liberty Mills, Nashville, Tenn.	J. S. McEachern, Wilmington, N. C.	Aug. 24
136	----do	----do	B. F. Mitchell Co., Wilmington, N. C.	Mar. 4
435	----do	Lynchburg Milling Co., Lynchburg, Va.	Hardison Co., Wadesboro, N. C.	Aug. 14
160	----do	C. D. Mayo & Co., Richmond, Va.	Johnston Bros., Greenville, N. C.	Mar. 10
440	----do	Mecklenburg Mills, Charlotte, N. C.		Aug. 23
60	----do	Mt. City Milling Co., Chattanooga, Tenn.	J. F. Fain, Murphy, N. C.	Jan. 20
46	----do	----do	Slayden-Fakes Co., Asheville, N. C.	Jan. 18
284	----do	----do	W. B. Cooper, Wilmington, N. C.	May 7
439	----do	Newport Mills Co., Newport, Tenn.	Cochran & McLaughlin Co., Charlotte, N. C.	Aug. 23
72	----do	W. E. Patton, Garden City, N. C.	Gaston & Troutman, Marion, N. C.	Jan. 26
317	----do	R. B. Peters Grocery Co., Tarboro, N. C.		----------
234	----do		E. A. Rankin & Co., Fayetteville, N. C.	Mar. 30
204	----do	Richmond Flour and Feed Co., Richmond, Va.	W. A. Myatt, Raleigh, N. C.	Mar. 21

TION OF BRAN—CONTINUED.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$						8.87	2.77	16.17	7.92	Wheat bran containing a large percentage of ground red corn cobs.
						9.00	2.79	17.24	4.27	do.
						10.31	3.95	10.45	5.55	Wheat bran containing some ground corn and corn cobs.
						13.50	2.50	17.32	4.09	Bran containing a large per cent of corn cobs.
	100	8.87	2.77	16.17		10.37	3.40	14.63		Wheat bran and ground corn cobs.
1.50	100					16.75	4.67	8.15	5.65	Wheat bran and some corn bran.
1.50	100					13.50	4.35	9.13	5.80	Wheat bran, oat chaff and a small amount of corn bran.
						13.50	4.92	5.95	6.17	Wheat bran containing corn bran.
1.40	100					12.52	3.80	7.76		Wheat bran, cockle and a large amount of chaff.
						14.62	4.32	6.79	5.47	Wheat bran containing some finely ground corn.
	100					14.25	5.43	7.20	4.88	Contains corn bran.
						17.44	4.62	5.39	3.62	Wheat bran, wheat screenings and some corn bran.
1.40	100					13.75	5.70	3.74	4.78	Wheat bran and corn bran.
	100					9.75	2.58	16.41	3.35	Wheat product with a small amount of corn product.
						14.72	4.27	8.52	6.01	All wheat product.
1.25	100					15.88	4.98	8.08	5.64	All wheat bran.
						15.13	6.14	9.55	6.92	Pure wheat bran.
1.25	100					14.50				do.
						15.75	3.26	6.82	4.89	All wheat product.
1.25	100					10.50	4.26	15.66	4.42	Contains corn bran.
1.35	100					15.50	5.36	10.32	7.13	Pure wheat bran.
1.40	100					14.50	6.13	4.81	3.86	Wheat middlings.
						15.37	4.50	8.80	6.18	Wheat bran with small amount corn bran.
1.25	100					15.62	3.86	6.46	7.17	All wheat product.
	100					14.88	4.54	9.15	5.93	All wheat bran.
1.40	100					15.25	4.25	9.25	6.88	Wheat bran, containing a great deal of trash.
						15.25	4.60	8.99	6.61	All wheat bran.
	80					17.37	4.55	5.73	4.09	do.
.95	75					13.38	4.33	12.18	7.43	Bran and rice chaff.
	75					12.13	5.10	12.26	7.37	Wheat bran and corn bran.
		12.50	3.50	8.50		12.12	4.56	6.44	6.26	do.
						16.00	4.97	8.22	5.34	All wheat bran.
1.50	100					12.13	4.05	5.83	3.84	Wheat and corn bran mixed.
						15.13	3.76	10.95	6.76	All wheat product.
						16.75	8.40	13.75	7.59	Wheat bran, rice chaff, corn bran.
						12.00	2.79	11.58	7.00	Wheat bran, rice chaff and corn product.

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
131	Bran	Richmond Flour and Feed Co., Richmond, Va.	S. S. Harriott & Co., New Bern, N. C.	Mar. 2
442	----do	Rutherfordton Milling Co., Rutherfordton, N. C.	O. T. Waldrop, Rutherfordton, N. C.	Aug. 25
94	----do	Siloam Roller Mill Co., Siloam, N. C.	D. A. Stone & Co., Mt. Airy, N. C.	Feb. 22
354	----do	Star Mills, Nashville, Tenn.	Burroughs, Coleman & Co., Henderson, N. C.	May 16
65	----do	Statesville Flour Mills, Statesville, N. C.		Jan. 25
75	----do	----do		Jan. 25
303	----do		State Hospital, Goldsboro, N. C.	May 15
134	----do	R. C. Stone Milling Co., Springfield, Mo.	John S. McEachern & Sons, Wilmington, N. C.	Mar. 4
373	----do	Tennessee Milling Co., Estill Springs, Tenn.	Carpenter, Roberson & Co., Durham, N. C.	May 10
177	----do	----do	The Teiser Co., Henderson, N. C.	Mar. 17
31	----do		J. H. Walker, Reidsville, N. C.	Jan. 25
107	----do	Wachovia Mills, Winston, N. C.	G. L. Dull & Co., Winston, N. C.	Feb. 25
77	----do	----do		Mar. 5
144	----do	White Star Mills, Staunton, Va.	Fonville Grocery Co., Goldsboro, N. C.	Mar. 5
411	----do	S. P. Wimbush (broker), Danville, Va.	Leaksville Grocery Co., Leaksville, N. C.	July 26
264	----do	From State Hospital, Morganton, N. C.		----------
412	----do	S. P. Wimbush (broker), Danville, Va.	C. E. Hubbard, Spray, N. C.	----------

DISCUSSION OF RESULTS.

Of the 85 samples of wheat bran examined 64 or 75 per cent contained less than 15.12 per cent protein, and are therefore not up to good standard quality. Four samples contained less than 10 per cent protein, and are therefore of very poor quality. Samples 186 and 203 contained 8.87 and 9.00 per cent of protein respectively. These samples were adulterated with about 35 per cent ground corn cobs and were being sold for pure wheat bran. Sample 402 contained 9.25 per cent protein and 27.36 per cent crude fiber. This bran was adulterated with rice chaff. Sample 339 contained 9.75 per cent protein. This sample was adulterated with corn product.

NATION OF BRAN—CONTINUED.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$ 1.40	100	------	------	------	------	10.75	4.01	14.27	7.80	Wheat bran, rice chaff and corn product.
1.40	100	------	------	------	------	16.25	2.85	6.57	3.88	All wheat product.
1.50	100	------	------	------	------	14.30	3.32	6.25	5.66	Wheat bran and corn bran.
------	100	------	------	------	------	15.25	4.12	9.42	------	Pure wheat product.
------	------	------	------	------	------	14.62	4.79	5.85	------	Wheat bran and corn bran.
------	------	------	------	------	------	15.10	5.18	11.39	8.45	All wheat product.
------	------	------	------	------	------	15.25	4.05	9.98	7.33	All wheat bran.
1.25	100	------	------	------	------	16.75	4.51	8.33	6.06	All wheat product.
1.30	100	------	------	------	------	14.50	4.46	9.48	------	Wheat bran.
1.25	100	------	------	------	------	16.38	3.87	9.29	6.62	do.
------	------	------	------	------	------	16.50	4.10	8.13	5.08	Wheat bran, corn bran and some [chaff.
1.35	100	------	------	------	------	13.00	4.35	10.25	6.20	Wheat bran and corn bran.
------	------	------	------	------	------	12.64	4.70	9.10	6.20	All wheat bran.
------	100	------	------	------	------	13.75	5.42	10.01	7.34	do.
------	------	------	------	------	------	15.12	5.00	8.70	------	Wheat bran and corn bran.
------	------	------	------	------	------	14.62	5.28	8.21	------	All wheat product.
------	------	------	------	------	------	16.00	5.33	10.04	------	Corn and wheat bran mixed.

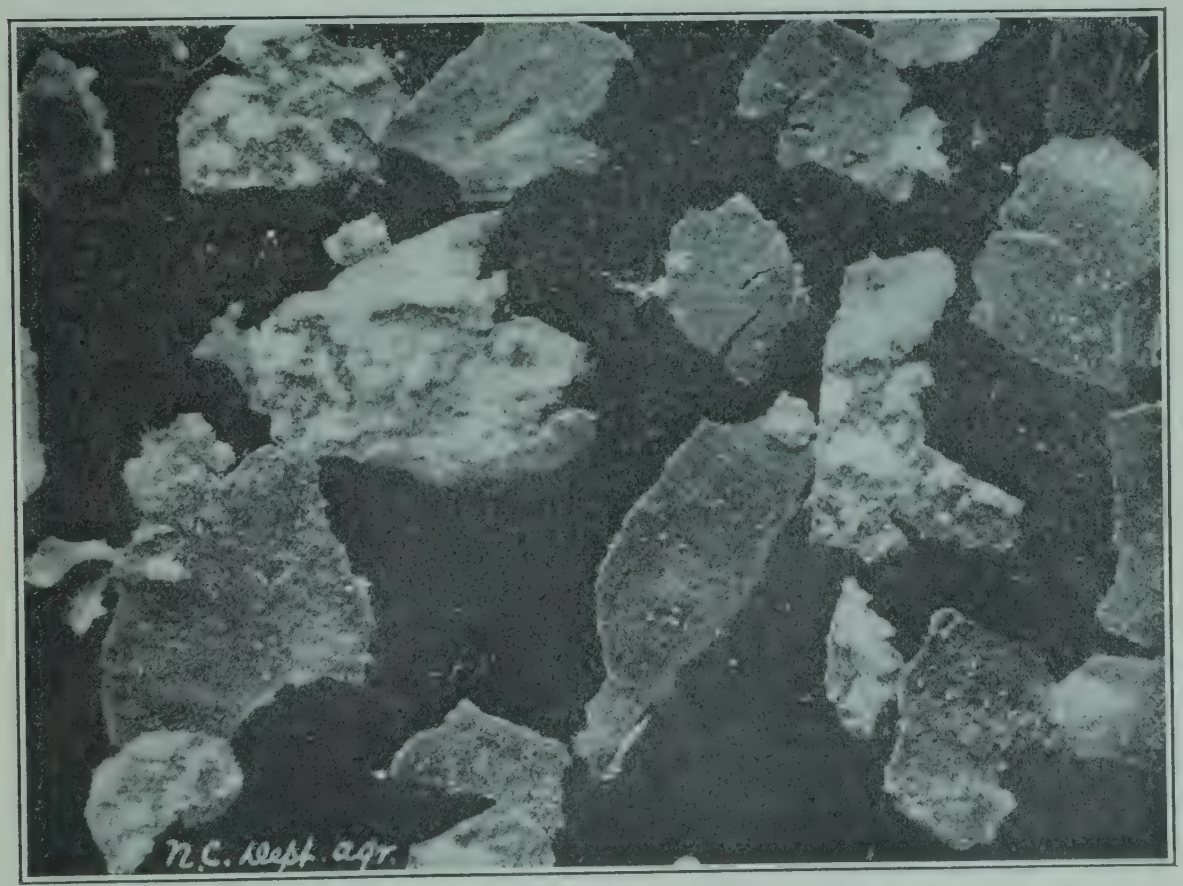


PLATE XI.

WHEAT BRAN AS IT APPEARS WHEN MAGNIFIED SEVEN TIMES. THE OUTER AND INNER SURFACES ARE SHOWN IN THE CUT.

WHEAT MIDDLINGS AND SHORTS.

The terms "middlings" and "shorts" are frequently used interchangeably. Some of the middlings have been found to be made up of reground bran, occasionally mixed with other products. Middlings are rich in protein and

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
446	Middlings	Asheville Middling Co., Asheville, N. C.	R. P. Freeman & Co., Hendersonville, N. C.	Sept. 2
445	----do	----do	H. P. Hyder, Hendersonville, N. C.	Sept. 2
392	----do	----do	C. H. Ray, Waynesville, N. C.	June 28
64	----do	----do	S. K. Breeding, Hendersonville, N. C.	Jan. 23
159	----do	Cumberland Mills, Nashville, Tenn.	R. B. Peters Grocery Co., Tarboro, N. C.	Mar. 9
336	----do	----do	----------	--------
163	----do	J. H. Cofer (jobber), Norfolk, Va.	M. G. Brown, Edenton, N. C.	Mar. 14
165	----do	J. M. Gwaltney, Norfolk, Va.	W. S. White, Elizabeth City, N. C.	Mar. 14
164	----do	----do	----do	Mar. 14
90	Middlings (Daisy)	Gambill & Davis, Roanoke, Va.	F. M. Poore, Mt. Airy, N. C.	Feb. 22
418	----do	----do	----do	July 29
92	----do	----do	H. Schofer, Mt. Airy, N. C.	Feb. 22
432	Middlings	C. A. Gambrill, Baltimore, Md.	L. H. Caldwell, Lumberton, N. C.	--------
152	Middlings (Daisy)	Huff, Andrews & Moyler Co., Roanoke, Va.	Hales & Edwards, Rocky Mount, N. C.	Mar. 9
262	Middlings	Holliday Middling Co., Cairo, Ill.	Phillips & Penny, Raleigh, N. C.	April 25
289	----do	Inglehart Bros., Evansville, Ind.	W. B. Overman, Wilson, N. C.	May 6
66	----do	Liberty Mills, Nashville, Tenn.	M. M. Shepherd, Hendersonville, N. C.	Jan. 23
397	----do	H. F. Hunt, Petersburg, Va.	Tomlinson, Bynum & Co., Wilson, N. C.	July 12
91	Middlings (Daisy)	Pittsburg-Washburn Flour Mills Co., Minneapolis, Minn.	H. Schofer, Mt. Airy, N. C.	Feb. 22
282	Middlings	----do	L. H. Caldwell, Lumberton, N. C.	May 5
316	----do	R. B. Peters Grocery Co. (jobbers), Tarboro, N. C.	Sent in by dealers	Aug. 6
253	----do	Sheffield-King Milling Co., Minneapolis, Minn.	J. Mathews & Co., Reidsville, N. C.	April 16
278	----do	Star Mills, Nashville, Tenn.	McLaurin & Shaw, Laurinburg, N. C.	May 4
259	----do	Tennessee Milling Co., Estill Springs, Tenn.	M. W. Lenderman, N. Wilkesboro, N. C.	April 22
217	----do	----do	The Patterson Co., Greensboro, N. C.	Mar. 24
408	----do	----do	Carpenter-Roberson, Durham, N. C.	July 21
407	----do	----do	J. T. Rogers, Durham, N. C.	July 21
400	----do	----------	Wilson Grocery Co., Wilson, N. C.	--------
267	----do	----------	----do	--------
413	----do	Washburn-Crosby Co., Minneapolis, Minn.	J. C. Henry, N. Wilkesboro, N. C.	July 25
430	----do	----do	Keith & Co., Aberdeen, N. C.	Aug. 4

low in fiber and for this reason are very excellent feed for hogs. The names middlings and shorts indicate that the feed is an all wheat product, but sometimes they are mixed with other substances, and when they are mixed their feeding value, in most cases, is reduced.

NATION OF MIDDLINGS.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$						13.56	4.23	4.19		All wheat product.
						15.87	4.06	3.12	2.62	Wheat middlings and corn product.
						17.87	4.68	4.55	2.50	Wheat product.
1.20	75					17.13	4.60	2.63	2.50	do.
1.35	100					16.50	4.70	8.40	4.36	All wheat product.
						17.00	4.83	5.44	4.87	do.
	100					15.00	9.63		3.87	do.
1.40	100					13.50			3.88	do.
1.40	100					14.88	4.98	7.05	4.84	do.
2.25	140					16.94	4.46	2.00	2.80	do.
2.35	140					18.12				do.
2.20	140					14.75	3.98	1.65	2.32	do.
						14.56	2.76	6.88	5.06	do.
1.50	140					19.13	6.44	2.98	3.43	do.
1.50	100					13.75	1.98	.87	1.07	do.
	100					16.75	4.23	4.90	3.54	All wheat middling.
1.40	100					17.88	5.89	.95	5.05	All wheat product.
1.50	100					12.25	4.29	4.87	4.47	Wheat middling, wheat bran and corn bran.
2.20	140					18.44	5.45	2.46	2.98	All wheat product.
	100					11.75	3.98	9.70	3.82	do.
						14.50	4.77	10.02	5.16	do.
	100					17.62	5.16	6.35	4.37	do.
	100					17.50	4.98	6.00	4.27	do.
1.40	100					17.25	4.19	3.93	3.30	do.
						18.13	6.08	5.46	4.51	do.
1.50	100					12.75	5.21	4.36		A wheat product containing some finely ground corn.
1.50	100									do.
						15.37	2.17	.77		All wheat product.
						13.63	2.10	.85	1.34	do.
1.50	100					18.25	5.95	8.81		do.
						17.87	5.30	8.72	4.30	do.

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
433	Middling and bran	Alvey Bros., Richmond, Va.	L. H. Caldwell, Lumberton, N. C.	Aug. 5
39	Bran and shorts	Atlanta Milling Co., Atlanta, Ga.	Newton Cotton Mill Store, Newton, N. C.	
429	----do	Lexington Roller Mills, Lexington, N. C.	Keith & Co., Aberdeen, N. C.	Aug. 4
443	----do	Marshall Milling Co., Marshall, N. C.	Redman & Ramsey, Marshall, N C.	Aug. 26
67	----do	Reed Bros., Morristown, Tenn.	R. P. Freeman, Hendersonville, N. C.	Jan. 23
28	----do	The Statesville Milling Co., Statesville, N. C.	John W. Smith, Charlotte, N. C.	Jan. 11
74	----do	----do		
391	Shorts	Asheville Milling Co., Asheville, N. C.	Staton Bros., Hendersonville, N. C.	June 27
70	Bran and shorts	----do	A. Ficker, Hendersonville, N. C.	Jan. 23
21	----do	Cooleemee Roller Mills, Cooleemee, N. C.	Max Moses, Salisbury, N. C.	Jan. 9
287	Shorts	Etowah Milling Co., Etowah, Ga.	Boykin & Co., Wilson, N. C.	May 5
422	----do	Hickory Milling Co., Hickory, N. C.	Phillips & Penny, Raleigh, N. C.	Aug. 22
42	----do	----do	Abernathy & Whitener, Hickory, N. C.	Jan. 14
415	Bran and shorts	Lexington Roller Mills Co., Lexington, Ky.	Tulburt-Hix Co., N. Wilkesboro, N. C.	July 27
61	Shorts	Mt. City Milling Co., Chattanooga, Tenn.	J. E. Fain, Murphy, N. C.	Jan. 20
56	----do	Newport Milling Co., Newport, Tenn.	Asheville Grocery Co., Asheville, N. C.	Jan. 18
227	----do	Weaverville Milling Co., Weaverville, N. C.	Sent by manager	Mar. 29
304	----do		Sent by State Hospital, Goldsboro, N. C.	

DISCUSSION OF RESULTS.

Fifty samples of middlings and shorts were collected and examined. Forty of these were all wheat products and of good quality, while ten were mixed with other substances, such as rice chaff and corn bran.

TION OF MIDDLINGS—CONTINUED.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$	100					10.37	2.07	9.99	6.04	Corn bran, wheat bran and rice chaff.
1.50	100					11.28	3.64	9.14	6.98	Wheat bran, corn product and rice chaff.
	100					14.87	5.20	7.20	4.83	All wheat product.
	75					16.12	3.87	4.76	3.46	do.
1.10	80					15.63	3.89	8.14	5.98	do.
1.10	80					16.25	5.90	8.85	5.36	Wheat bran and corn bran.
						18.25	5.19	8.04	6.57	All wheat product.
1.25	75					15.75	4.09	2.27	2.45	Corn and wheat product.
1.20	75					12.25	4.94	2.53	2.50	Wheat product containing a small amount of corn.
						14.50	4.86	5.49	4.17	Bran, shorts and some corn bran.
	100					15.25	5.17	5.20	4.08	All wheat product.
1.50	100					15.25	4.80	2.63	1.78	do.
1.50	100					15.50	4.62	3.01	2.60	do.
1.50	100					15.87	3.20	5.39		do.
1.30	100					12.38	3.28	8.60	3.89	Wheat bran, corn product and rice chaff.
	75					14.36	5.79	2.85	2.73	All wheat product.
						11.62	4.07	4.40	2.28	Shorts, wheat bran and ground corn.
						17.50	5.63	5.18	5.11	All wheat product.

It will be noticed from the analyses in the table above that where the middlings are not mixed the per cent of protein varies from 15 to 18 per cent, while in the ten samples of middlings that are mixed the per cent of protein varies from 10 to 12, showing that when mixed the feeding value of the middlings is reduced.

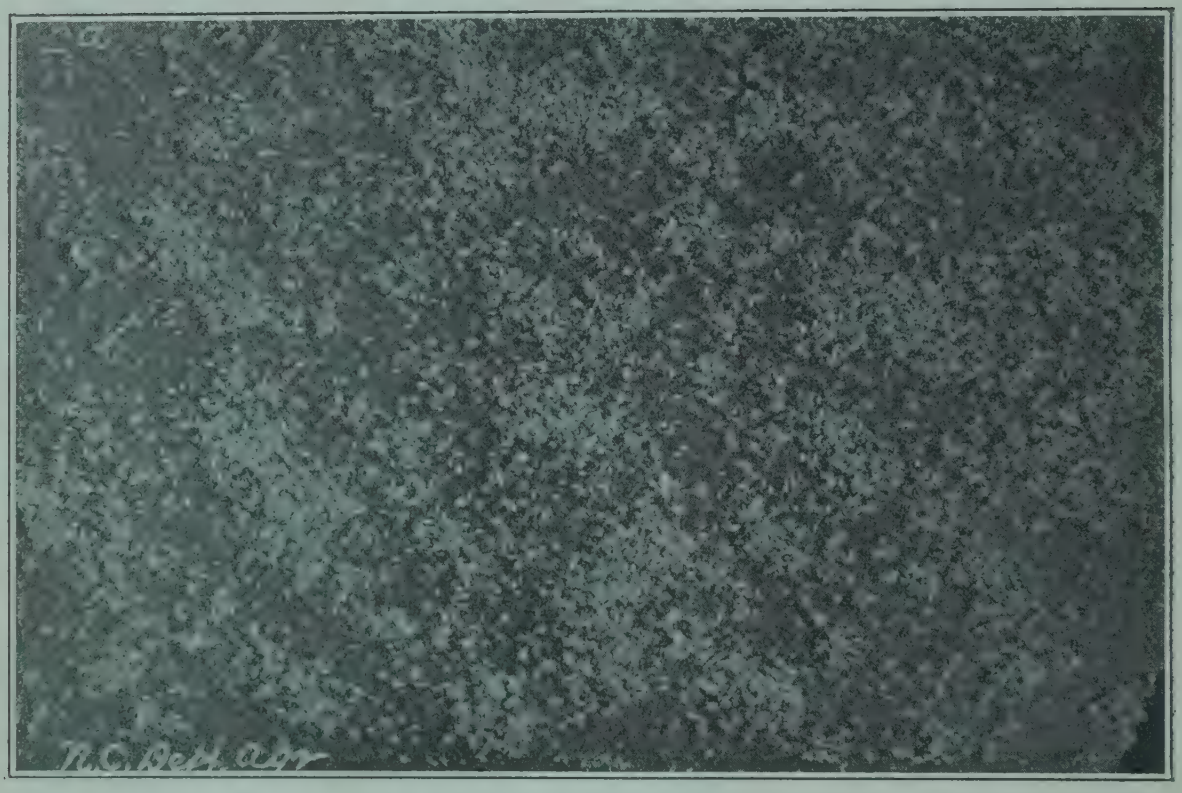


PLATE V.

SHIP STUFF CONTAINING RICE CHAFF, AS IT APPEARS TO THE NAKED EYE.
A COMMON MIXTURE FOUND IN THE STATE.

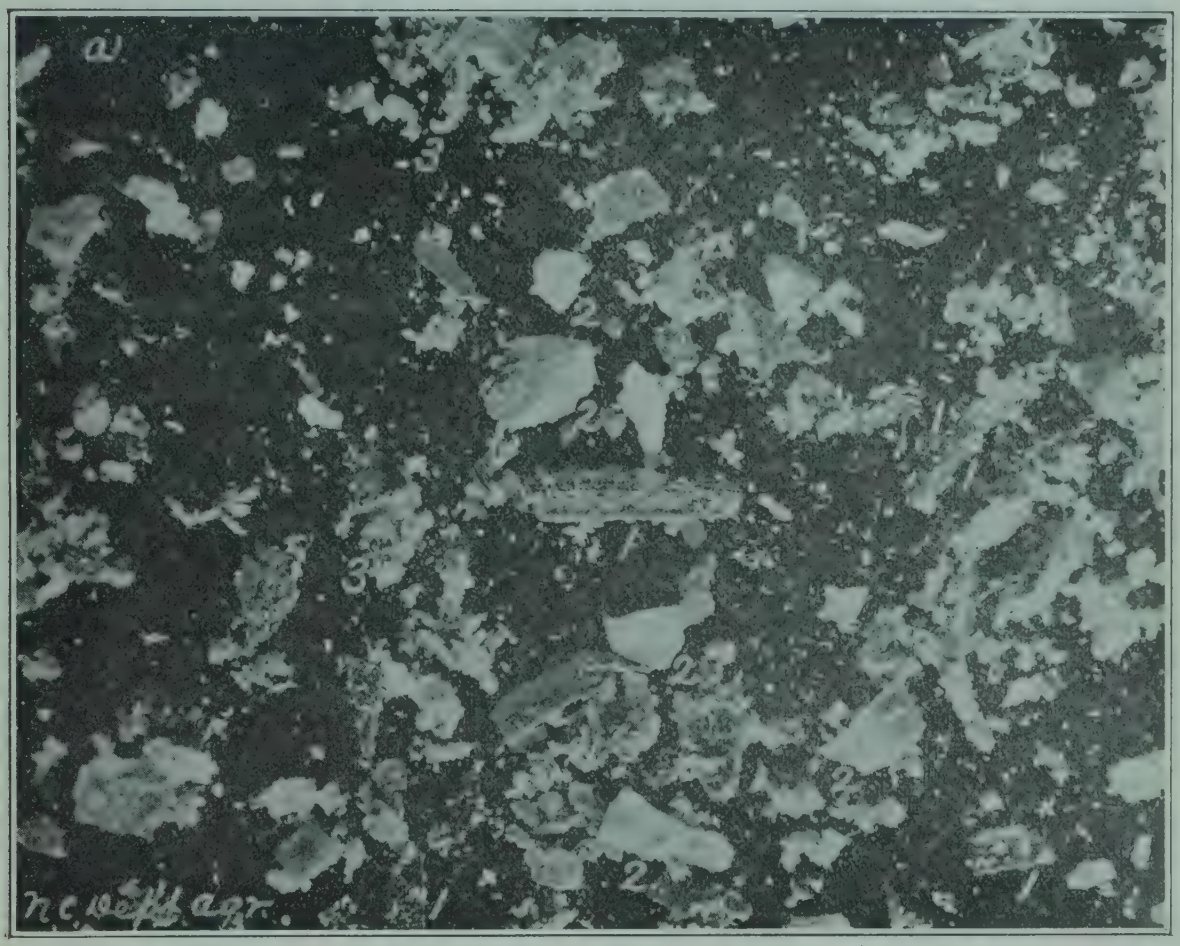


PLATE VI.

SHIP STUFF CONTAINING RICE CHAFF, AS IT APPEARS WHEN MAGNIFIED SEVEN TIMES. THE RICE CHAFF IS SEEN VERY PLAINLY IN THE CENTER OF THE CUT.

SHIP STUFF.

This is a name that applies to a mixture of no definite composition. It generally indicates a finely ground product, which may be an all wheat prod-

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
114	Ship stuff	Adams Grain and Provision Co., Charlotte, N. C.	Sent by manager	Mar. 1
249	----do	Andrews & Co., Minneapolis, Minn.	Madison Grocery Co., Madison, N. C.	April 15
376	----do	Asheville Milling Co., Asheville, N. C.	John R. Proctor, Durham, N. C.	April 19
71	----do	----do		
196	----do	----do	W. H. Ferrall & Bro., Durham, N. C.	Mar. 18
187	----do	----do	C. A. Carroll, Oxford, N. C.	Mar. 17
257	----do	Atlanta Milling Co., Atlanta, Ga.	J. C. Henry, N. Wilkesboro, N. C.	April 21
175	----do	----do	Southern Grocery Co., Henderson, N. C.	Mar. 17
271	----do	----do	C. B. Grant, Southern Pines, N. C.	April 29
305	----do		H. C. Goode, Connelly Springs, N. C.	May 21
351	----do	Atlanta Milling Co., Atlanta, Ga.	Davis & Walker Co., Henderson, N. C.	May 16
34	----do	----do	Sent by manager	
63	----do	----do	Wilson Mercantile Co., Hendersonville, N. C.	June 23
387	----do	Ballard & Ballard, Louisville, Ky	M. M. Sheppard, Hendersonville, N. C.	June 27
190	----do	----do	J. S. Brown, Oxford, N. C.	Mar. 17
341	----do	----do	J. P. Braswell & Son, Battleboro, N. C.	May 12
200	----do	Carrolina Roller Mills, Durham, N. C.	Carrolina Roller Mills, Durham, N. C.	Mar. 18
340	----do	City Hay and Grain Co., Norfolk, Va.	J. L. Harris, Weldon, N. C.	May 12
377	----do	Cosby-Menefee Co., Lynchburg, Va.	S. T. Buchanan, Dickerson, N. C.	May 19
206	----do	Crimora Roller Mills, Crimora Station, Va.	J. P. Myatt & Bro., Raleigh, N. C.	Mar. 21
179	----do	----do	Burroughs & Coleman, Henderson, N. C.	Mar. 17
352	----do	Mike Collins (jobber), Henderson, N. C.	The Teiser Co., Henderson, N. C.	May 16
3	----do	Cumberland Mills, Nashville, Tenn.	C. A. Norris, Raleigh, N. C.	Jan. 5
367	----do	Dan Valley Mills, Danville, Va.	E. H. Crenshaw & Co., Oxford, N. C.	May 1
1	----do	----do	Hunter & Dunn, Raleigh, N. C.	Jan. 5
2	----do	----do	Newcombe & Peebles, Raleigh, N. C.	Jan. 5
105	----do	----do	P. R. Lamb & Co., Winston, N. C.	Feb. 25
57	----do	Dry-Heath Milling Co., Concord, Tenn.	Sent by manager	Feb. 8
232	----do	Dunlop Mills, Richmond, Va.	Austin-Stephenson Co., Smithfield, N. C.	Mar. 28
256	----do	----do	Blair & Co., N. Wilkesboro, N. C.	Feb. 27

uct or a mixture with a wheat product as the basis and such other substance as finely ground corn bran, rice chaff, corn cobs and oat hulls.

Ship stuff is so fine that the adulterants cannot be seen with the naked eye, and this fact is taken advantage of by unscrupulous manufacturers, and accounts for the large number of adulterated samples found.

NATION OF SHIP STUFF.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$						11.44	3.73	7.56	6.38	Ground wheat bran, corn bran, chaff and some whole grains of wheat.
2.15	140					19.75	6.33	2.63	4.11	All wheat product.
1.35	100					13.36				Wheat middlings, finely ground corn and corn bran.
						20.69	3.10	4.25	3.57	All wheat product.
1.35	100					11.50	4.94	7.00	4.64	Corn and wheat product.
1.25	80					14.13	4.07	2.88	2.08	do.
1.35	100					14.00	3.29	10.68	6.86	Wheat bran finely ground, corn bran and rice chaff.
1.35	100					10.56	3.51	9.66	1.32	Finely ground wheat bran, rice chaff and corn product.
	100	14.00	4.00	9.00		9.75	3.34	8.99	6.50	Wheat bran, corn bran and rice chaff.
						2.00	2.27	41.02	19.06	All rice chaff.
1.45	100					9.62	3.05	11.25		Wheat middlings, corn product and rice chaff.
						15.62	4.38	8.59	6.03	Wheat middlings, corn bran and rice chaff.
1.15	75					13.38	3.89	7.08	4.63	Wheat middlings, corn product and rice chaff.
	100					18.36	4.80	5.82	3.95	All wheat product.
1.45	100					16.90	5.30	6.57	4.90	do.
1.40	100					16.50	5.62	6.87		do.
1.35	100					17.00	5.22	6.66	4.67	All wheat product.
1.50	100					10.87	3.28	10.41		Wheat bran, ground corn and corn husks.
						10.87	5.46	5.20		
						12.00	4.65	5.99	4.44	All wheat product.
1.35	100					14.75	4.78	5.25	3.92	do.
1.60	100					18.00	5.05	3.50	3.76	do.
						12.30	4.46	5.20	3.77	do.
						15.12	5.18	7.04		do.
						14.50	4.41	5.95	4.47	do.
	100					15.06	4.67	6.37	5.07	do.
1.35	100					15.38	4.64	6.96	5.11	do.
						11.62	3.70	11.37	2.35	Wheat middlings containing some corn product.
						15.17	4.47	6.19	4.87	All wheat product.
						14.12	6.34	6.10	4.84	do.

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
369	Ship stuff	Dunlop Mills, Richmond, Va.	Pitchford & Co., Oxford, N.C.	May 18
342	----do	----do	I. T. Wood & Co., Enfield, N.C.	May 12
4	----do	----do	Phillips & Penny, Raleigh, N.C.	Jan. 5
133	----do	S. G. Fairbanks Co., Richmond, Va.	S. S. Harriott & Co., New Bern, N. C.	Mar. 2
80	----do	Forsyth Roller Mills, Winston, N. C.	----------	----------
245	----do	A. W. Fuller, Fuller, N. C.	J. E. Meredith, Thomasville, N. C.	April 9
416	----do	Gambill & Davis, Roanoke, Va.	Tulburt & Hix, North Wilkesboro, N. C.	July 2
188	----do	Harman & DeRundeau, Crimora Station, Va.	J. W. & D. L. Fuller, Oxford, N. C.	Mar. 17
24	----do	Harrisonburg Milling Co., Harrisonburg, Va.	Glenn & Carroll, Concord, N.C.	Jan. 9
261	----do	----do	Hunter & Dunn, Raleigh, N.C.	April 25
425	----do	Hickory Milling Co., Hickory, N. C.	W. A. Myatt, Raleigh, N. C.	Sept. 6
419	----do	High Point Milling Co., High Point, N. C.	J. W. Harris & Co., High Point, N. C.	Aug. 1
251	----do	H. W. Hines (broker), Reidsville, N. C.	D. R. Ellington, Reidsville, N. C.	April 16
191	----do	Holliday Milling Co., Cairo, Ill.	J. T. Rogers & Co., Durham, N. C.	Mar. 18
192	----do	Holt Granite Manufacturing Co., Haw River, N. C.	----do	Mar. 18
84	----do	Adams Grain and Provision Co., Charlotte, N. C.	J. T. Houston, Charlotte, N. C.	Feb. 24
118	----do	S. C. Hurt & Son, Lynchburg, Va.	Sent by manufacturer	Mar. 3
215	----do	----do	R. G. Hiatt, Greensboro, N. C.	Mar. 24
268	----do	----do	Hunter & Olive, Apex, N. C.	April 27
166	----do	----do	W. L. McGhee, Franklinton, N. C.	May 16
12	----do	----do	D. M. Morris & Son, Thomasville, N. C.	Jan. 8
20	----do	----do	Klutz & Randleman, Salisbury, N. C.	Jan. 9
7	----do	----do	J. W. Harris & Co., High Point, N. C.	Jan. 7
25	----do	----do	Dry-Heath Miller Co., Concord, N. C.	Jan. 9
51	----do	Knoxville City Mills, Knoxville, Tenn.	Sent by manufacturer	Jan. 29
99	----do	----------	M. W. Lenderman, North Wilkesboro, N. C.	Feb. 23
353	----do	The Lewis Mills, Danville, Va.	Burroughs & Coleman, Henderson, N. C.	May 16
239	----do	Liberty Mills, Nashville, Tenn.	W. M. Sanders, Smithfield, N.C.	Mar. 29
388	----do	----do	M. M. Sheppard, Hendersonville, N. C.	June 28
103	----do	----do	Cromer Bros. & Co., Winston, N. C.	Feb. 25
311	----do	----------	W. A. Liles, Wakefield, N. C.	July 1
154	----do	Lynchburg Milling Co., Lynchburg, Va.	Rocky Mount Supply Co., Rocky Mount, N. C.	Mar. 9
436	----do	----do	Hardison Co., Wadesboro, N.C.	Aug. 14
194	----do	Manchester Mills, Manchester, Va.	J. T. Rogers & Co., Durham, N. C.	Mar. 18
273	----do	G. D. Mayo & Co., Richmond, Va.	----------	----------
406	----do	----do	J. W. & D. L. Fuller, Oxford, N. C.	July 20

TION OF SHIP STUFF—CONTINUED.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$						13.26	6.34	5.10		Wheat product and some finely ground corn.
1.40	100					14.25	10.14	5.04	5.77	All wheat product.
	100					15.00	4.65	6.42	4.97	do.
1.40	100					11.13	4.20	14.32	7.08	Wheat and corn product.
						13.63	3.99	3.64	3.14	All wheat product.
	90	12.00	4.00	9.00		12.62	2.93	1.62	2.63	Wheat and corn bran.
1.50	100					12.56	4.70	14.20		Finely ground wheat bran and corn bran.
1.40	100					14.63	4.60	3.85	4.08	All wheat product.
1.25	100					15.13	4.92	5.92	4.38	do.
1.40	100					18.12	4.65	4.75	4.32	do.
1.50	100					15.37	4.60	1.90	2.18	do.
						13.62				Wheat bran and rice chaff.
	100					15.12	2.78	.53	1.66	All wheat product.
1.50	100					13.38	2.14	.66	1.03	do.
1.00	75					15.25	5.70	5.87	4.45	do.
	80					14.12	4.16	7.91	5.55	Corn bran, wheat bran and rice chaff.
						12.56	4.07	6.23	2.27	Ground corn and wheat product.
1.50	100					12.56	4.88	5.59	2.11	do.
	100	12.00	4.00	7.00		11.62	4.10	4.56	2.29	Corn and wheat product.
1.50	100	12.00	4.00	7.00		11.37	4.20	3.99		do.
	80					11.25	3.75	2.95	2.73	Wheat and corn product.
1.40	100					13.63	2.86	2.86	2.29	do.
1.45	100					12.75	3.35	3.07	2.27	do.
	100					12.38	3.23	2.95	2.45	
						15.44	5.78	6.50	4.36	All wheat product.
1.40	100					16.19	4.78	4.42	3.86	do.
1.75	90					17.50	5.16	3.01	3.65	do.
						16.63	4.89	4.20	3.92	do.
	100					18.37	5.85	4.45	3.73	do.
1.30	100					18.44	5.23	5.57	4.78	do.
						7.88	3.00	11.94	7.80	Ground corn and rice chaff.
1.35	100					13.52	4.40	4.04	3.13	All wheat product.
1.45	100					19.50	4.72	4.47	3.36	do.
1.35	100					15.88	4.87	10.67	7.65	Wheat bran, rice chaff and corn product.
						11.62	4.38	12.63	5.05	All wheat product.
1.55	100					15.00	5.36			do.

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
365	Ship stuff	J. D. Manor & Co., Newmarket, Va.	Sterlington Corn Mill Store, Franklinton, N. C.	May 16
372	----do	----do	E. H. Lawrence, Durham, N. C.	May 19
403	----do	----do	Hunter & Dunn, Raleigh, N. C.	July 15
23	----do	R. B. Moses & Bro., Chatham, Va.	J. P. Harper & Bro., Salisbury, N. C.	Jan. 9
89	----do	E. R. Messick (jobber), Winston, N. C.	----------	Feb. 22
5	----do	Mt. City Milling Co., Chattanooga, Tenn.	Crowder & Rand, Raleigh, N. C.	Jan. 5
9	----do	----do	Lexington Grocery Co., High Point, N. C.	Jan. 7
22	----do	----do	M. Moses, Salisbury, N. C.	Jan. 9
41	----do	----do	W. S. Long & Co., Hickory, N. C.	Jan. 14
274	----do	----do	Whitlock & Morrison, Rockingham, N. C.	April 3
348	----do	----do	R. J. Madry, Scotland Neck, N. C.	May 14
368	----do	----do	----------	May 10
258	----do	----do	J. C. Henry, N. Wilkesboro, N C.	April 21
386	----do	----do	S. K. Breeding, Hendersonville, N. C.	June 27
404	----do	----do	Parham Bros., Oxford, N. C.	July 20
332	----do	New Prague Flouring Mill, New Prague, Minn.	N. R. Zimmerman & Co., Elizabeth City, N. C.	May 11
346	----do	Port Republic Milling Co., Port Republic, Va.	Taylor's Grocery Store, Scotland Neck, N. C.	May 14
307	----do	Raleigh Milling Co., Raleigh, N. C.	----------	--------
370	----do	Roper & Co., Petersburg, Va.	Fuller Montague, Oxford, N. C.	May 18
149	----do	Richmond Flour and Feed Co., Richmond, Va.	T. R. Lamm, Wilson, N, C.	Mar. 8
156	----do	----do	----------	--------
181	----do	----do	Parham Bros. Supply Co., Henderson, N. C.	Mar. 17
228	----do	----do	M. C. Winston, Selma, N. C.	Mar. 29
230	----do	----do	H. J. Hood, Selma, N. C.	Mar. 28
237	----do	----do	B. C. Glass, Maxton, N. C.	April 1
279	----do	----do	----do	May 4
361	----do	----do	Royal Grocery Co., Dunn, N. C.	May 13
434	----do	----do	W. N. Pinkton, Wadesboro, N. C.	Aug. 1
347	----do	----do	R. J. Madry, Scotland Neck, N. C.	May 14
384	----do	J. Allen Smith & Co., Knoxville, Tenn.	Overman & Co., Salisbury, N. C.	June 22
168	----do	----do	Zimmerman & Co., Elizabeth City, N. C.	Mar. 14
102	----do	----do	Farmers Implement Co., N. Wilkesboro, N. C.	Feb. 23
255	----do	Star Mills, Nashville, Tenn.	McIntosh & Hamer, Laurinburg, N. C.	--------
199	----do	Statesville Flour Mills, Statesville, N. C.	E. H. Lawrence & Co., Durham, N. C.	Mar. 18
209	----do	----do	Hunter & Dunn, Raleigh, N. C.	Mar. 21
241	----do	----do	McMurry-Hull Co., Shelby, N. C.	April 6

TION OF SHIP STUFF—CONTINUED.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$ 1.60	100	------	------	------	------	15.50	5.60	4.55	------	All wheat product.
1.40	100	------	------	------	------	13.50	.80	5.17	------	do.
------	------	------	------	------	------	12.00	3.50	5.48	------	Screenings and finely ground corn.
1.40	100	------	------	------	------	14.32	5.95	2.59	2.38	All wheat product.
------	------	------	------	------	------	15.81	4.20	3.74	3.53	do.
------	100	12.50	3.50	8.50	------	11.82	3.15	4.28	1.21	Wheat bran, corn bran and rice chaff.
------	50 / 80	12.50	3.50	8.50	------	12.94	3.84	5.20	4.78	do.
------	80	12.50	3.50	8.50	------	14.75	3.63	9.86	7.48	Wheat bran and rice chaff.
1.40	100	12.50	3.50	8.50	------	11.63	5.03	6.38	4.61	do.
------	------	12.50	3.50	8.50	------	12.37	3.81	8.42	6.12	Finely ground wheat bran, corn bran and rice chaff.
------	100	------	------	------	------	11.62	3.85	11.57	------	Finely ground wheat bran and corn bran.
------	100	12.50	3.50	8.50	------	13.75	4.42	7.96	------	Wheat product, corn bran and rice chaff.
1.40	100	12.50	3.50	8.50	------	12.50	2.70	9.95	6.17	Finely ground wheat bran, corn bran and rice chaff.
1.50	100	12.50	3.50	8.50	------	9.37	3.29	12.48	4.65	A corn product and rice chaff.
------	100	------	------	------	------	9.37	3.06	9.37	------	Wheat middlings, corn product and rice chaff.
1.35	100	------	------	------	------	16.87	5.05	8.02	6.91	All wheat product.
1.50	100	------	------	------	------	14.62	4.69	5.76	------	Wheat middlings.
------	------	------	------	------	------	12.35	3.70	3.33	------	Ground whole corn and wheat product.
1.50	100	------	------	------	------	17.50	6.03	5.20	------	All wheat product.
1.50	100	------	------	------	------	10.08	5.00	8.27	4.29	Contains corn product and rice chaff.
------	------	------	------	------	------	9.52	4.07	15.71	9.91	Rice chaff, some ground rice, wheat bran, whole grains of corn and small amount of corn husks.
1.35	100	------	------	------	------	9.88	3.70	9.91	4.84	Wheat bran, rice chaff and some ground corn.
------	------	------	------	------	------	9.00	2.54	18.47	9.43	Corn bran and rice chaff.
------	------	------	------	------	------	8.35	2.62	15.86	7.37	do.
------	------	------	------	------	------	8.90	3.01	13.28	6.62	Some wheat product, mostly rice chaff and corn bran.
------	------	------	------	------	------	11.12	3.57	11.74	6.33	Mostly rice chaff, some corn bran and wheat middlings.
------	------	------	------	------	------	9.75	4.22	5.79	------	Wheat product, corn product and rice chaff.
1.35	80	------	------	------	------	10.06	------	18.56	7.49	Rice chaff and wheat middlings.
------	100	------	------	------	------	12.25	3.43	14.89	------	Wheat product, rice chaff and corn product.
1.50	100	------	------	------	------	15.00	6.30	7.39	3.73	Wheat product.
1.40	100	------	------	------	------	14.25	5.75	6.50	4.29	All wheat product.
1.40	100	------	------	------	------	13.21	4.44	4.91	3.97	do.
------	------	------	------	------	------	17.87	3.54	4.45	4.19	do.
1.30	100	------	------	------	------	15.38	4.22	4.84	4.21	Wheat and corn product.
------	------	------	------	------	------	17.13	5.57	5.78	5.88	do.
1.20	80	14.00	4.50	5.00	------	15.37	5.47	5.21	3.98	do.

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
73	Ship stuff	Statesville Flour Mills, Statesville, N. C.		
43	----do	----do	Forney & Co., Morganton, N. C.	June 15
362	----do	Stuarts Draft Milling Co., Stuarts Draft, Va.	W. H. Bynum & Co., Franklinton, N. C.	May 16
178	----do	Tennessee Milling Co., Estill Springs, Tenn.	The Teiser Co., Henderson, N. C.	Mar. 17
40	----do	----do	Bost & Newton, Hickory, N. C.	Jan. 14
100	----do	Lenderman (broker), North Wilkesboro, N. C.	L. N. Tomlinson, N. Wilkesboro, N. C.	Feb. 23
106	----do	Wachovia Mills, Winston, N. C.	G. L. Dull & Co., Winston, N. C.	Feb. 25
213	----do	----do	John D. Waddill, Dennis, N. C.	Mar. 23
97	----do	----do	Kirkman & Co., Elkins, N. C.	Feb. 23
76	----do	----do		
216	----do	J. H. Walker & Co., Reidsville, N. C.	R. S. Hiatt, Greensboro, N. C.	Mar. 24
252	----do	----do	J. H. Burton, Reidsville, N. C.	Apr. 16
108	----do	Washburn-Crosby Co., Minneapolis, Minn.	Hutcherson Bros., Reidsville, N. C.	Feb. 26

DISCUSSION OF RESULTS.

One hundred and sixteen samples of ship stuff were examined; 53 were wheat products, but not all high grade; 41 were high grade, containing 15 per cent of protein, or more; 44 samples were medium grade, containing between 12 and 15 per cent protein; 18 were fairly medium grade, containing between 9 and 12 per cent protein; 12 were low grade, containing between 6 and 9 per cent protein.

TION OF SHIP-STUFF—CONTINUED.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$----	------	------	------	------	------	15.38	5.93	6.46	4.75	All wheat product.
1.50	100	------	------	------	------	18.50	4.18	7.90	4.64	do.
1.50	100	------	------	------	------	13.25	3.63	4.89	------	do.
1.35	100	------	------	------	------	18.13	4.50	4.44	3.98	do.
1.50	100	------	------	------	------	16.38	4.14	3.88	3.43	do.
1.40	100	------	------	------	------	13.13	5.33	4.97	3.86	
1.60	98	------	------	------	------	12.88	4.35	4.75	3.55	
------	98	------	------	------	------	14.75	5.71	3.88	3.19	Corn and wheat product.
------	------	------	------	------	------	13.87	4.33	4.41	3.30	do.
------	------	------	------	------	------	13.63	4.50	4.53	3.29	do.
1.50	100	12.37	4.11	7.57	------	11.25	6.63	6.14	3.52	do.
------	100	------	------	------	------	16.25	5.53	3.15	4.17	All wheat product.
2.20	140	------	------	------	------	18.18	5.21	3.17	3.21	do.

Sample 305 was sent in as a ship stuff, but was found to be all rice chaff and is very low in feeding value. Thirteen samples had the guaranteed analysis attached, and 8 of these, or 61 per cent, were below the guarantee.

Samples 149, 156, 181, 228, 230, 237, 279, 347, 361 and 434 were very low grade.

The most careful and rigid inspection of ship stuff should be made before purchasing, for in the fineness of the product there is likely to be deception.

The above analyses and remarks should be carefully studied.

PLATE X.

RICE CHAFF MAGNIFIED SEVEN TIMES. THIS CHAFF IS USED EXTENSIVELY AS A FILLER IN FEEDS. ITS FEEDING VALUE IS EXTREMELY LOW.

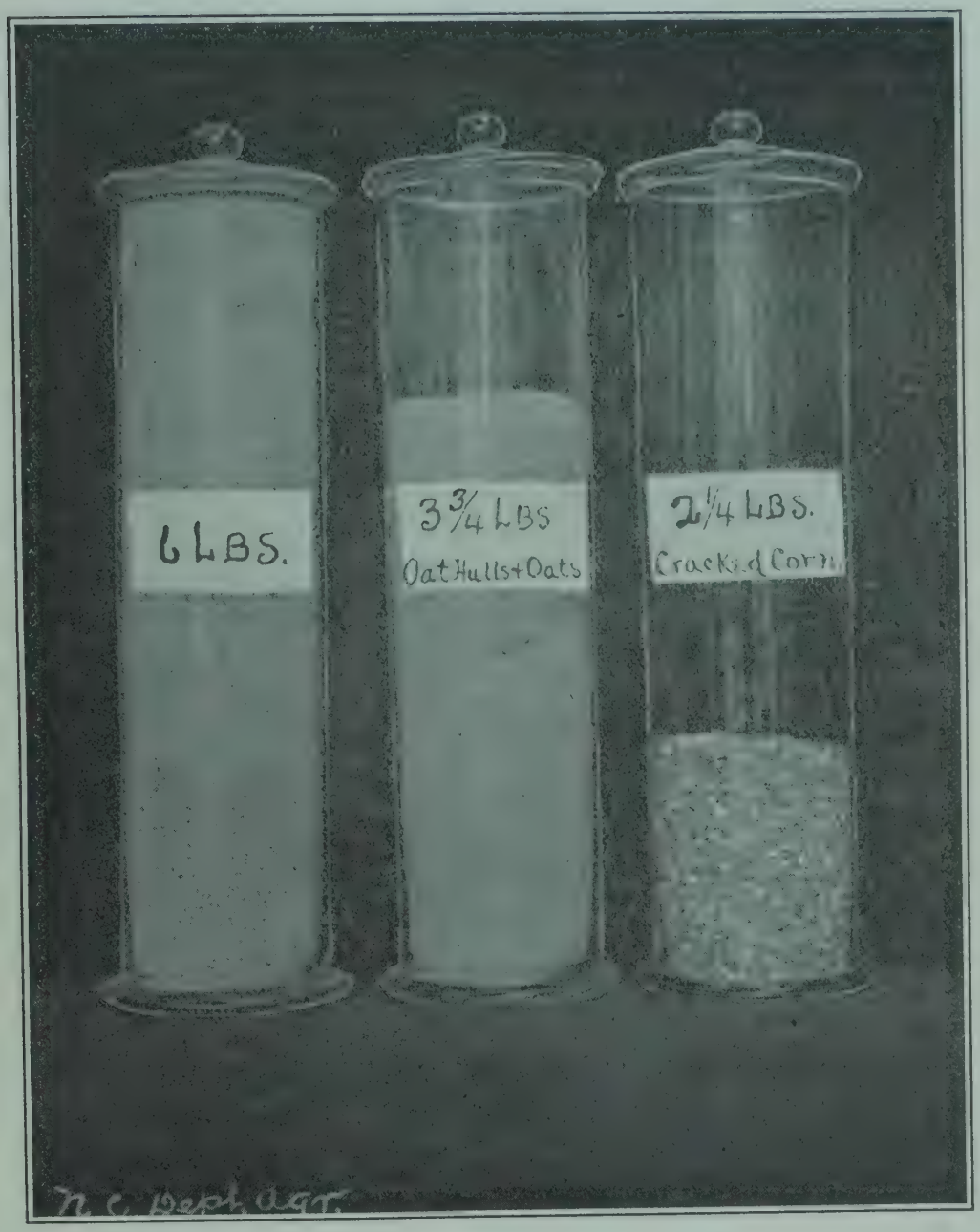


PLATE XIV.

CORN AND OAT FEED—A SAMPLE OF A CLASS OF FEEDS THAT ARE OFFERED FOR SALE IN THE STATE. SIX POUNDS CONTAINED THREE AND THREE-FOURTHS OAT HULLS AND OATS AND TWO AND ONE-FOURTH POUNDS CARCKED CORN. THE OAT HULLS COMPOSE THE LARGEST PART OF THESE FEEDS, AND THEIR FEEDING VALUE IS CONSEQUENTLY VERY LOW.

CORN AND OAT FEEDS.

In the manufacture of oat products for human food the kernel of the oat is separated from the hull. Oat hulls are in themselves low in food value, being very much like straw in this regard. Their value may be materially greater if broken kernels or small oats are ground in with them. Manufacturers of oat products are putting ground oat hulls on the market in many forms, such as Oat Feed, Oat Chops, Corn and Oat Feed, Purina Feed, Boss Corn and Oat

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
116	Boss Corn and Oat Feed	Adams Grain and Provision Co., Richmond, Va.	----------	--------
363	Corn and Oats	----do ----------	A. S. Joyner, Franklinton, N. C.	May 16
334	Boss Corn and Oat Feed	Great Western Cereal Co., Chicago, Ill.	----do ----------	--------
143	----do ----------	----do ----------	Fonville Grocery Co., Goldsboro, N. C.	Mar. 5
431	----do ----------	----do ----------	L. H. Caldwell, Lumberton, N. C.	Aug. 5
269	----do ----------	----do ----------	C. B. Grant, Southern Pines, N. C.	April 29
280	Best Corn and Oat Feed	National Cereal Co. ----------	L. H. Caldwell, Lumberton, N. C.	May 5
358	----do ----------	----do ----------	W. H. Hardie, La Grange, N. C.	May 11
26	Excelsior Corn and Oat Feed.	Great Western Cereal Co., Chicago, Ill.	Chambers & Moody, Charlotte, N. C.	Jan. 11
54	Model Corn and Oat Feed	Lewis Leonhardt & Co., Knoxville, Tenn.	Asheville Grocery Co., Asheville, N. C.	Jan. 18
441	----do ----------	----do ----------	J. L. Smathers Co., Murphy, N. C.	Aug. 31
112	Corn and Oat Feed ------	American Cereal Co., Chicago, Ill.	Davis & Wolf, Charlotte, N. C.	--------
52	Corn and Oat Feed (kiln-dried).	----do ----------	D. G. Noland, Asheville, N. C.	Jan. 16
283	Corn and Oats ----------	Barton & Jeffrey ----------	Cash Grocery Co., Fayetteville, N. C.	May 6
170	Corn and Oats Ground --	Elizabeth City Milling Co., Elizabeth City, N. C.	From Mill ----------	Mar. 14
291	Corn and Oats ----------	Robert Johnson Co., Norfolk, Va.	Hales & Edwards, Rocky Mount, N. C.	May 6
16	Model Corn and Oat Feed	Lewis Leonhardt & Co., Knoxville, Tenn.	Klutz & Randleman, Salisbury, N. C.	Jan. 9
277	Corn and Oat Chops -----	Shockoe Mills, Warner Moore & Co., Richmond, Va.	J. M. Evans, Laurinburg, N. C.	May 4
300	Ground Corn, Oats and Bran.	W. A. White, Elizabeth City, N. C.	W. S. White, Elizabeth City, N. C.	May 11
167	Corn and Oats Ground --	Zimmerman & Co., Elizabeth City, N. C.	Zimmerman & Co. ----------	Mar. 4
214	Purina Feed ----------	Ralston Purina Co., St. Louis, Mo.	R. G. Hiatt, Greensboro, N. C.	Mar. 24
236	----do ----------	----do ----------	J. A. Springer, Wilmington, N. C.	April 8
263	----do ----------	----do ----------	Phillips & Co., Raleigh, N. C.	April 25
276	----do ----------	----do ----------	Leak & Marshall, Wadesboro, N. C.	May 27
294	----do ----------	----do ----------	E. K. Willis, Washington, N. C.	May 7
315	----do ----------	----do ----------	Sent in by Hall & Pearsall, Wilmington, N. C.	July 30
101	Quaker Dairy Feed ------	American Cereal Co., Chicago, Ill.	Farmers Implement Co., N. Wilkesboro, N. C.	Feb. 23
162	----do ----------	----do ----------	Albemarle Grocery and Feed Co., Edenton, N. C.	Mar. 14

Feed, Nim Oat Feed, Victor Corn and Oat Feed, Model Corn and Oat Feed, Quaker Dairy Feed, and others. The bulk of all these materials is ground oat hulls with an admixture of ground corn and oat kernels. The feeding value of them is variable and they should never be bought except on a guaranteed composition, and then it should be remembered that the oat hulls are not as digestible as the kernel of oats or other grains.

The price paid for these feeds is, as a rule, far in excess of their feeding value when compared with wheat bran, middlings and cotton-seed meal.

TION OF CORN AND OAT FEEDS.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$-----	------	------	------	------	------	9.50	5.63	9.02	------	Some ground corn, mostly ground oats and oat hulls.
1.50	100	9.00	4.00	------	------	8.87	5.63	12.93	------	Some ground corn and oats, but mostly oat hulls.
------	------	------	------	------	------	8.00	5.10	12.76	------	do.
------	100	9.00	4.00	------	------	9.52	6.41	9.64	3.31	do.
------	100	9.00	4.00	------	------	------	5.03	------	------	do.
------	100	9.00	4.00	------	------	8.75	5.02	11.88	3.83	do.
------	100	------	------	------	------	6.63	2.39	17.32	8.30	Some ground corn, but mostly oat chaff.
------	100	------	------	------	------	6.37	2.87	17.16	------	Some ground corn and oats, but mostly oat hulls.
------	100	9.00	4.00	------	------	9.13	6.01	10.65	4.65	Some ground corn with a large per cent of oat hulls.
1.50	100	------	------	------	------	7.88	3.91	14.93	4.05	Oat hulls, cracked corn and some ground oats.
------	100	9.00	4.00	------	------	12.12	1.88	16.95	5.10	do.
------	------	------	------	------	------	8.75	2.93	11.65	3.55	Some ground corn and oats, mostly oat hulls.
1.75	100	------	------	------	------	11.28	4.82	10.68	4.88	Ground oats, oat hulls and ground corn.
------	100	------	------	------	------	8.62	3.10	3.08	------	Some ground corn, whole oats and whole corn.
1.25	100	------	------	------	------	7.88	4.88	3.52	2.63	Whole oats and corn ground.
1.30	100	------	------	------	------	8.31	4.42	12.72	5.05	Ground corn, whole oats and oat hulls.
------	100	9.00	4.00	------	------	------	3.48	12.02	2.16	Ground corn, oats and oat hulls.
------	------	------	------	------	------	8.87	2.74	1.74	1.50	Ground corn and whole oats.
1.35	100	9.00	4.00	5.00	------	9.75	4.74	4.34	3.33	Ground corn, oats and wheat bran.
------	------	------	------	------	------	8.88	4.90	3.76	1.56	Whole corn and oats ground.
1.50	175	5.66	3.63	13.30	------	7.50	4.99	11.46	6.36	Cracked corn and oats and large per cent of oat chaff.
1.50	175	5.66	3.33	13.30	------	10.88	4.45	10.71	6.18	Some ground oats and corn, but mostly oat hulls.
1.50	175	5.66	3.63	13.30	------	8.12	3.11	14.63	12.77	do.
1.50	175	5.66	3.63	13.30	------	7.62	3.69	12.00	7.05	do.
------	80	5.66	3.63	13.30	------	7.87	3.85	9.80	5.22	do.
------	------	5.66	3.63	13.30	------	7.38	3.54	16.10	6.96	do.
1.40	100	14.00	3.50	------	------	12.71	4.70	18.63	5.78	Some ground corn and oats, large per cent oat hulls.
------	100	14.00	3.50	------	------	13.75	4.20	17.43	5.64	do.

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
132	Royal Feed	S. S. Harriett & Co., New Bern, N. C.	S. S. Harriett & Co., New Bern, N. C.	Mar. 4
115	Royal Corn and Oats	Adams Grain and Provision Co., Richmond, Va.		
98	Royal Oat Feed	Great Western Cereal Co., Chicago, Ill.	Click & Co., Elkin, N. C.	Feb. 23
87	----do	----do	W. A. Hyatt, Waynesville, N. C.	Feb. 5
104	Victor Corn and Oat Feed.	American Cereal Co., Chicago, Ill.	P. R. Lamb & Co., Winston, N. C.	Feb. 25
6	----do	----do	Crowder & Rand, Raleigh, N. C.	Jan. 5
438	----do	----do	Adams Grain and Provision Co., Charlotte, N. C.	

DISCUSSION OF RESULTS.

Thirty-five samples of corn and oat feeds have been analyzed. Some of these are sold under special brand names and are extensively advertised throughout the State as feeds sold on their merit.

Samples 87 and 98, Royal Oat Feed, and 280 and 358, Best Corn and Oat Feed, are very low grade feeds, containing less than 7 per cent protein, and number 98 contains less than 6 per cent protein.

Only 11 samples of the 35 examined contain over 9 per cent protein. Eight samples fall below the guarantee in per cent of protein. Sample 98, Royal Oat Feed, contains only 5.62 per cent protein and 26.10 per cent crude fiber. This is a very inferior feed, being mostly oat hulls with a small amount of cracked corn added.

OF CORN AND OAT FEEDS—CONTINUED.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$ 1.25	100	10.00	6.00	7.00	------	9.38	6.74	8.00	4.95	Corn meal, wheat bran, ground oats and whole oats.
------	------	7.00	2.50	24.00	------	7.56	2.89	23.11	7.32	Some ground corn, mostly oat chaff.
------	100	7.60	2.80	------	------	5.62	2.15	26.10	7.32	Oat hulls and some ground corn.
------	100	7.00	2.80	------	------	6.62	2.44	26.27	6.99	Ground corn and oats, oat hulls.
------	100	------	------	------	------	8.00	3.08	12.83	3.41	do.
------	100	9.00	4.00	------	------	8.50	2.67	10.52	3.61	do.
------	------	------	------	------	------	9.75	3.20	11.37	3.34	do.

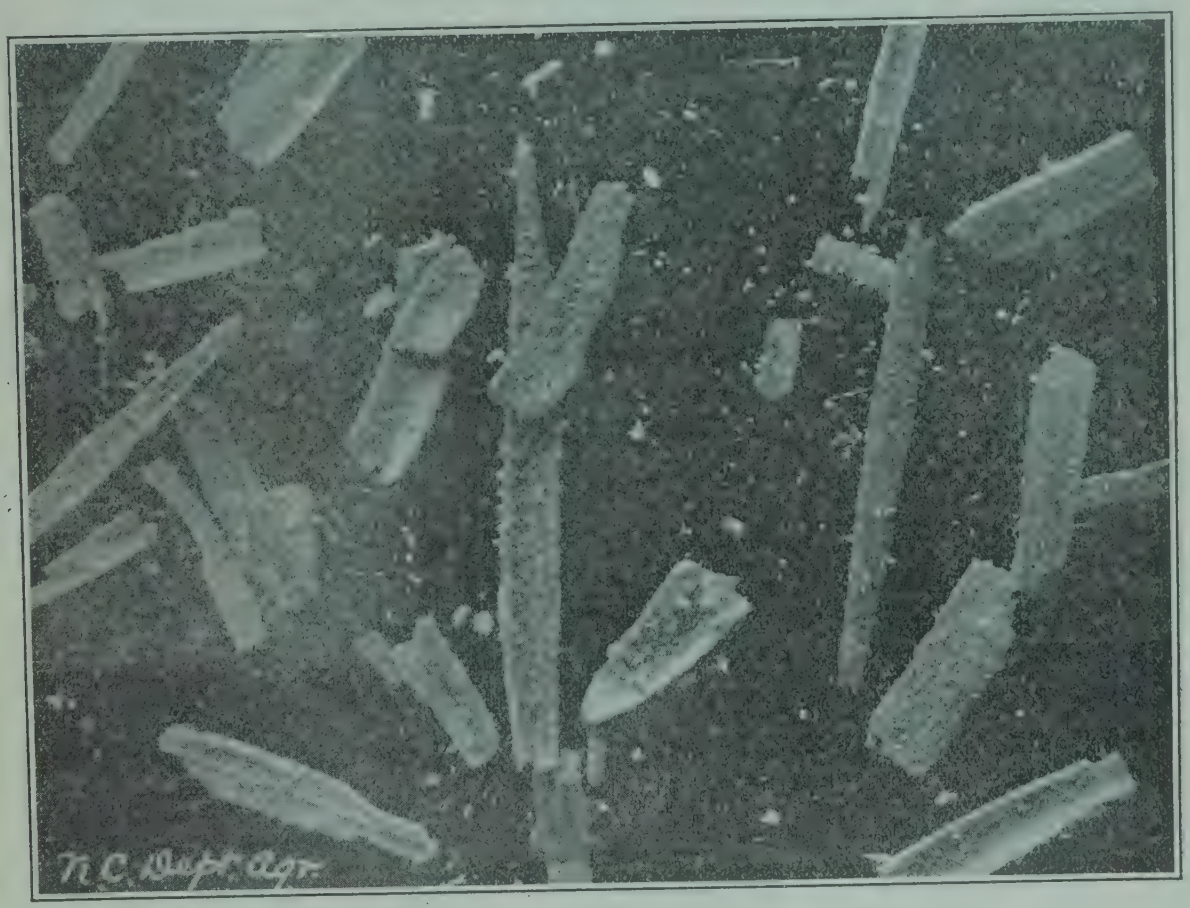


PLATE VII.

OAT HULLS AS THEY APPEAR WHEN MAGNIFIED SEVEN TIMES. THESE HULLS ARE GROUND FINE AND USED AS AN ADULTERANT IN FEEDS.

RICE FEEDS.

There are two rice mills in North Carolina, one in Goldsboro and the other in Elizabeth City. In preparing rice for human consumption the mills first remove the two outer layers and then polish the grain before it is ready for the market. Rice bran, rice polish and rice meal, which are known as rice feeds, are the by-products from the manufacture of rice for human consumption. Rice bran is the thin skin which lies next to the rice grain; rice polish

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
343	Rice Bran	Carolina Rice Mills, Goldsboro, N. C.	C. M. Davey, Tarboro, N. C.	May 13
359	Rice Meal	do	Fonville Grocery Co., Goldsboro, N. C.	May 21
288	do	do	Wilson Grocery Co., Wilson, N. C.	May 5
265	do	do	do	May 5
266	do	do		May 5
301	Rice Polish	do		May 5
309	Rice Meal		Sent by S. M. Boddie, Nashville, N. C.	
224	do	Carolina Rice Mills, Goldsboro, N. C.		
223	do	do	Sent by manufacturers	
128	Rice Bran	Elizabeth City Milling Co., Elizabeth City, N. C.	Burrus & Gray, New Bern, N. C.	Mar. 2
33	do	do	do	Jan. 28
448	do	Planters' Rice Mill Co., Savannah, Ga.		
396	Rice Meal	West Point Mill Co., Charleston, S. C.	Wells Grocery Co., Wilson, N. C.	July 12
148	do		J. T. Williams & Co.	Mar. 8
146	Rice Polish			
146	do	Carolina Rice Mills, Goldsboro, N. C.	Sampled at Mill	Mar. 5
449	do	do	do	
142	Rice Bran	do	Bizzel & Wooten, Goldsboro, N. C.	Mar. 5
147	do	do	Sampled at mill	
145	do	do	do	

DISCUSSION OF RESULTS.

Twenty samples of rice feeds were examined and all were found to be up to the usual standard.

Sample 146 contained a small per cent of rice hulls.

is the by-product from polishing the rice grain after the bran has been removed; rice meal is a mixture of rice bran and rice polish. Pure rice bran is seldom found in this State, as in the majority of cases it is mixed with rice hulls or chaff, and its feeding value is accordingly reduced. The polish is free from hulls and other substances and is about as good feed as corn meal, and can be fed profitably when purchased at the same price.

Rice feeds have a high fat content, and for this reason their keeping quality is rather poor.

TION OF RICE PRODUCTS.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$	100	------	------	------	------	11.12	11.87	------	------	All rice product.
------	100	12.37	13.44	7.66	------	11.75	------	9.08	------	Rice meal.
------	100	10.00	8.00	13.00	------	10.87	7.63	9.83	7.72	do.
------	------	------	------	------	------	10.62	10.20	16.09	10.97	do.
------	------	------	------	------	------	10.91	9.89	12.24	9.57	do.
------	------	------	------	------	------	9.00	6.60	.20	------	do.
------	------	------	------	------	------	10.00	9.08	14.29	10.43	do.
------	------	------	------	------	------	12.38	12.60	8.52	7.75	do.
------	------	------	------	------	------	10.37	10.09	16.59	12.03	Rice bran, broken grains of rice and hulls.
1.10	100	------	------	------	------	10.44	8.60	14.04	5.83	Rice product.
------	------	------	------	------	------	11.94	8.73	10.89	5.86	Rice bran.
------	------	9.00	6.50	22.50	------	9.50	6.72	21.29	------	do.
------	------	------	------	------	------	11.38	9.43	6.28	6.99	Rice meal and some rice chaff.
------	------	------	------	------	------	9.31	10.79	17.00	12.65	All rice product.
------	------	------	------	------	------	11.00	10.60	5.05	4.93	Rice polish, with some rice chaff.
------	------	------	------	------	------	11.00	10.00	5.05	4.93	Rice by-product.
------	------	------	------	------	------	11.37	10.31	.85	------	do.
------	------	------	------	------	------	10.50	10.73	12.23	9.04	All rice product.
------	------	------	------	------	------	11.00	7.25	13.15	4.10	do.
------	------	------	------	------	------	12.25	15.50	9.17	6.99	do.

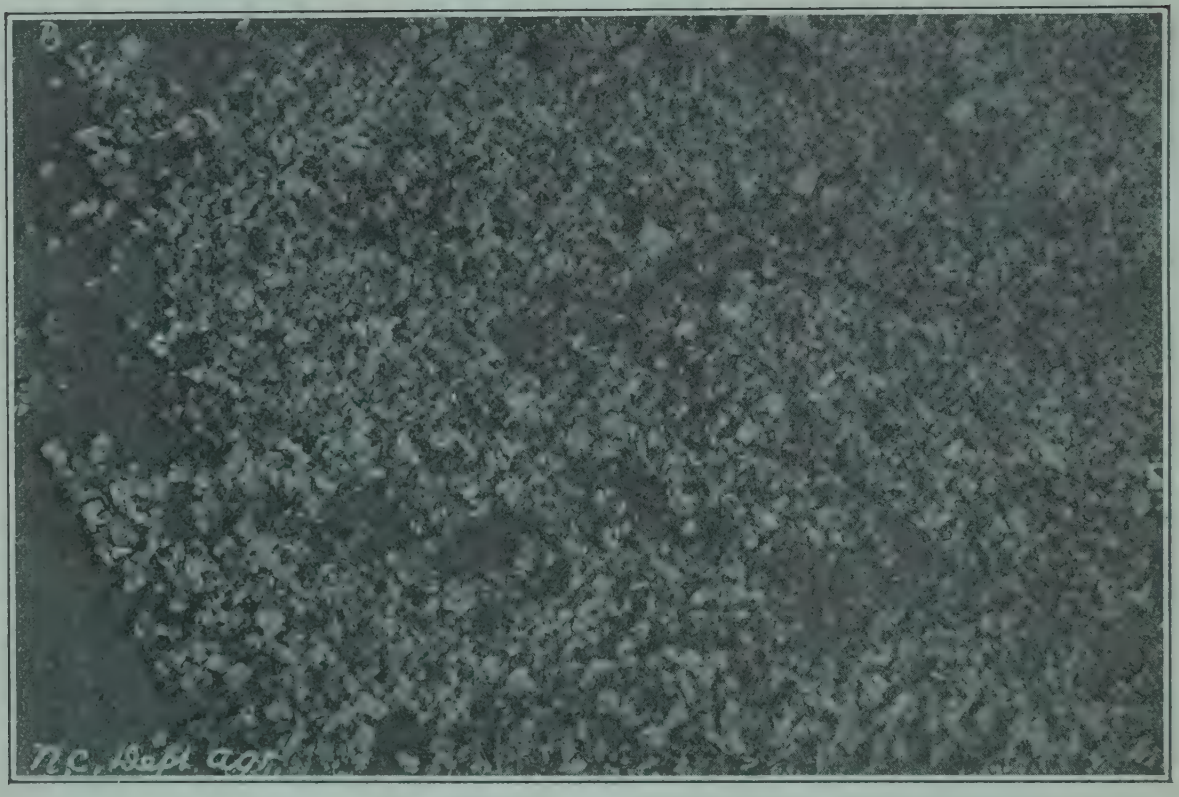


PLATE III.

WHEAT BRAN CONTAINING PEANUT HULLS, AS IT APPEARS TO THE NAKED EYE.

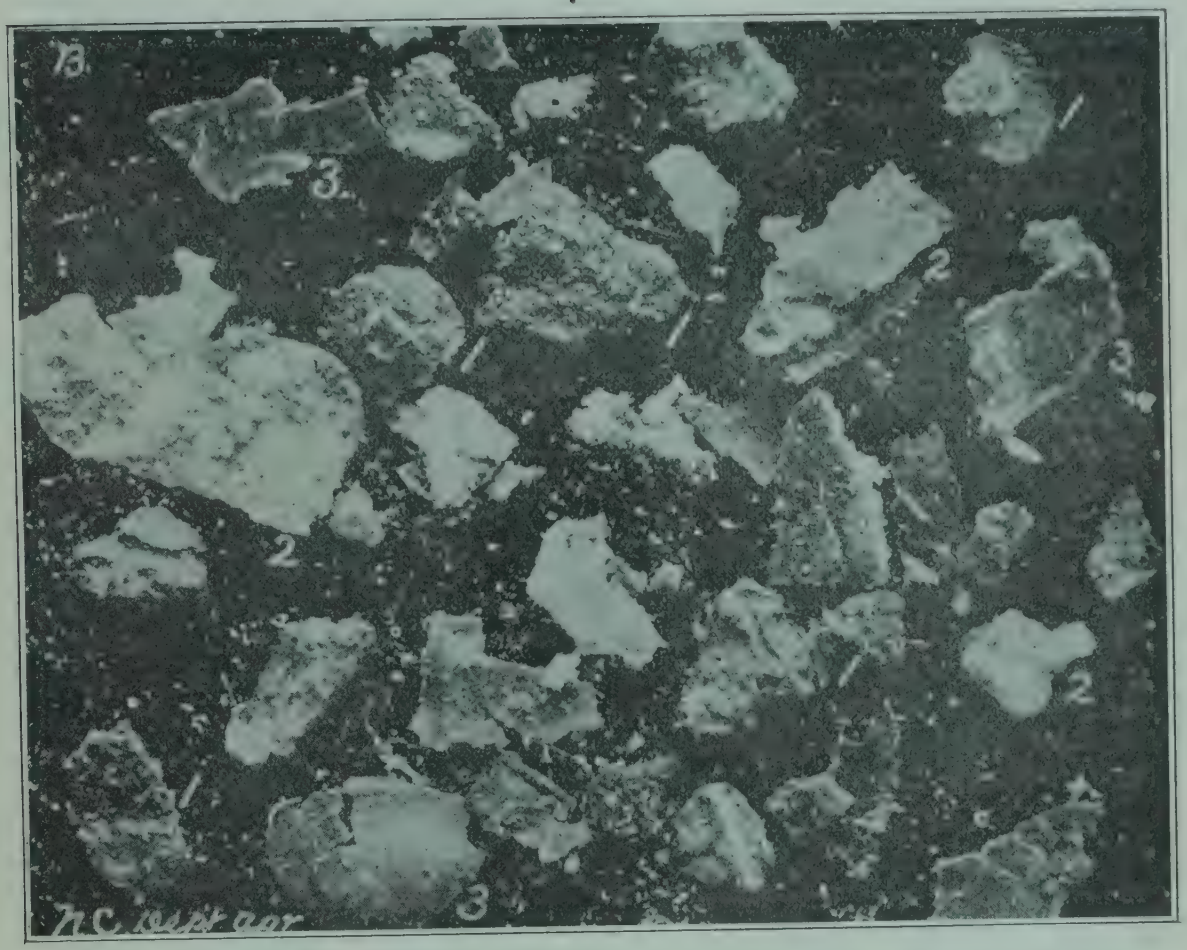


PLATE IV.

WHEAT BRAN CONTAINING PEANUT HULLS, AS IT APPEARS WHEN MAGNIFIED SEVEN TIMES.

Fig. 1 shows peanut hulls. Fig. 2 shows inner surface of wheat bran. Fig. 3 shows outer surface of wheat bran.

PEANUT FEEDS.

There are two kinds of peanut feeds found on the market. One is composed of the broken peanuts mixed with the screenings and is sold for chicken and

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
171	Peanut Feed (Chickens)	Carolina Peanut Co., Weldon, N. C.	Carolina Peanut Co., Weldon, N. C.	Mar. 16
172	Peanut Feed (Hogs)	----do	----do	
173	Peanut Screenings	----do	----do	
182	Peanut Meal		W. S. Parker & Co., Henderson, N. C.	Mar. 17
382	Peanut Middlings	Phœnix Milling Co., Petersburg, Va.	Klutz & Randleman, Salisbury, N. C	June 22
385	----do	----do	Asheville Grocery Co., Asheville, N. C.	June 24
383	Peanut Bran	----do	W. T. Klutz, Salisbury, N. C.	June 22
349	Peanut Meal	----do	W. S. Parker & Co , Henderson, N. C.	May 16

DISCUSSION OF RESULTS.

Eight samples of peanut feeds have been analyzed. Three of these were manufactured by the Carolina Peanut Company, of Weldon, N. C., and three by the Phœnix Milling Company, of Petersburg, Va. The manufacturer of No. 182 is not known. Samples 382, 385, 383 and 349 are all composed of the same thing—ground peanut shells—and there is no difference between them, although they are called peanut middlings, bran and meal.

hog feed. The other is finely ground peanut shells, sold as peanut middlings or bran for cattle and horses. The first of these is an excellent feed for chickens and hogs, but the second, being composed almost entirely of ground peanut hulls, is of low quality and a very poor feed.

TION OF PEANUT FEEDS.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$ 1.00	100	------	------	------	------	24.38	37.58	6.74	5.59	Broken peanuts and some screenings.
1.00	100	------	------	------	------	24.78	35.40	4.33	6.26	Broken peanuts and some ground shells.
------	------	------	------	------	------	21.38	27.26	18.53	4.00	Screenings.
------	------	------	------	------	------	7.38	1.44	44.85	21.65	Ground peanut hulls.
1.00	100	8.5	1.3	40.00	------	13.10	4.21	41.55	10.28	Mostly finely ground peanut hulls.
------	------	8.5	1.3	40.00	------	13.06	4.15	33.80	8.10	do.
.90	100	8.5	1.3	40.00	------	9.13	1.78	66.35	1.64	do.
------	100	------	------	------	------	8.37	1.54	46.70	12.22	Mostly ground peanut hulls.

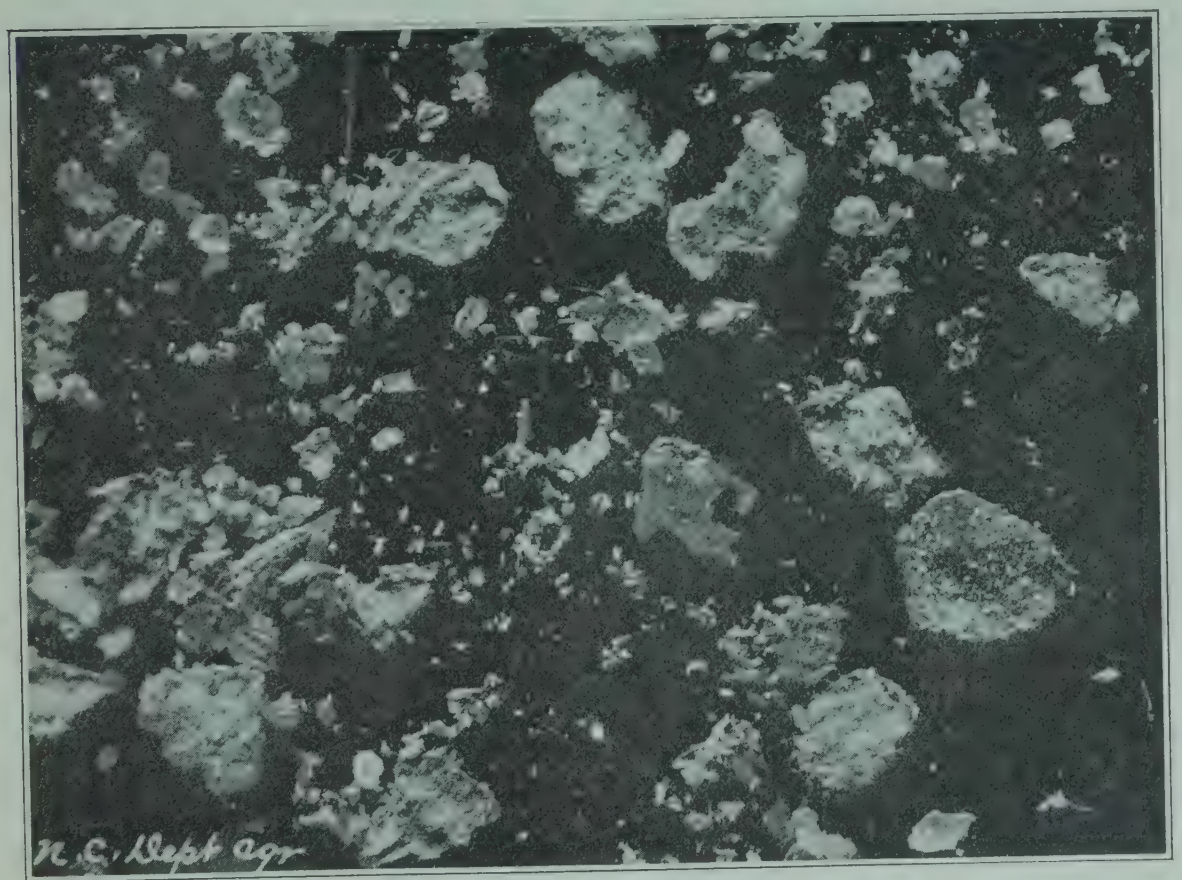


PLATE IX.

PEANUT HULLS MAGNIFIED SEVEN TIMES. THESE HULLS ARE LOW IN PROTEIN AND FAT CONTENT AND THEIR VALUE AS A FEED IS VERY SMALL.

SACCHARINE (SUGAR) FEEDS.

The feeds are mixtures of molasses and feeds rich in protein, and should be productive of good results, provided the mechanical condition is satisfactory and the price is not excessive.

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
78	Dairy Feed			
390	Saccharine	Louis Leonhardt & Co., Knoxville, Tenn.	King & Marshall, Hendersonville, N. C.	April 27
53	----do	----do	Asheville Grocery Co., Asheville, N. C.	Jan. 18
29	----do	----do		
15	----do	----do	Klutz & Randleman, Salisbury, N. C.	Jan. 9
122	Dried Molasses, Beet Pulp.	Alma Sugar Co., Alma, Mich.	Shadeland Dairy and Stock Farm, Wilmington, N. C.	

DISCUSSION OF RESULTS.

Six molasses feeds were examined. Five of these are sold under the brand name of Saccharine Feed and are composed of ground corn and oats, distillers' grains, cotton-seed meal and molasses.

THE GLUTEN FEEDS.

Gluten meal and the gluten feeds are the residues or parts of residues from the manufacture of starch and glucose from corn. The process, while perhaps differing somewhat, consists essentially in the separation, first of the germ and hull from the starch and gluten, and second the final separation of the gluten from the starch. The residue in this manufacture may therefore consist of

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
121	Gluten Feed	Glucose Sugar Refining Co., Chicago, Ill.	Shadeland Dairy and Stock Farm, Wilmington, N. C.	
423	Buffalo Gluten Feed	----do	John S. McEachern, Wilmington, N. C.	Aug. 24
286	Gluten Feed		----do	May 18
447	----do		Biltmore Farm, Biltmore, N. C.	
314	----do		----do	Aug. 1

Molasses is a carbohydrate and can be fed in small quantities to cattle satisfactorily, but when mixed with rich protein substances can be used in large quantities with good results.

OF SACCHARINE (SUGAR) FEEDS.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein	Fat.	Fiber.	Ash.	
$										
		17.00	4.00			10.81	9.83	13.95	7.78	Ground corn, oats, distillers' grains, cotton-seed meal and molasses.
		17.00	4.00			11.75	3.68	12.18	4.11	do.
		17.00	4.00			16.57	4.04	11.20	5.87	do.
		17.00	4.00				4.65	13.51	6.20	do.
1.00	100					10.94	.70	7.06	7.10	Beet pulp and molasses.

From the analyses these feeds are above the average mixed feed on the market in fat content and up to the average in protein per cent, though not fully up to guarantee in this last constituent.

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either of three products when the gluten, germ and hulls are kept separate, or mixtures of two or of all three of these. The entire residue mixed together is in color a brighter yellow than corn meal and is called gluten feed. The gluten by itself is distinguished by a high content of protein and deep yellow color and is called gluten meal.

OF GLUTEN FEEDS AND MEAL.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$ 1.30	100					23.62	2.43	11.17	3.28	Corn product.
		28.00	3.00			22.81	3.90	7.62	1.98	do.
						23.25	3.44	7.95	1.82	do.
						30.00				Corn product, with some barley hulls.
						28.75	11.64	11.27	2.00	do.

DISCUSSION OF RESULTS.

Gluten feeds of good quality should contain about 24 per cent of protein, 10 per cent of fat and not much more than 5 per cent of fiber. Two samples are above the guarantee in protein and fat, while numbers 121, 423 and 286 are below, and besides contain a high per cent of crude fiber. The low per cent

---

CHOPS.

The name "chops" generally means a feed composed entirely of corn product,

RESULTS OF THE EXAM

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
135	Chops	Boney & Harper, Wilmington, N. C.	B. F. Mitchell, Wilmington, N. C.	
86	----do	Granite City Mills, Mt. Airy, N. C.	From mill	Jan. 29
338	----do	J. M. Gwaltney & Co., Norfolk, Va.	Jennette Bros., Elizabeth City, N. C.	May 11
360	----do	G. D. Mayo & Co., Richmond, Va.	Royal Grocery Co., Dunn, N. C.	May 13
254	Corn Chop	Southern Milling Co., Nashville, Tenn.	Blair & Co., N. Wilkesboro, N. C.	Apr. 14
247	Chops	Warner Moore & Co., Richmond, Va.	W. P. Evans, Laurinburg, N. C.	Apr. 1

DISCUSSION OF RESULTS.

Six samples of chops were analyzed. Two were all corn products and up to standard quality.

of protein in these samples may be due to the quality of corn used or to an excessive amount of hulls added.

From the analyses it will be seen that gluten feeds contain about seven per cent more protein than wheat bran or wheat middlings, and accordingly have a greater feeding value. At the present price of gluten feeds, which is $26 a ton, their use should be more extensive.

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but this is not strictly adhered to, as some chops have been found containing corn mixed with oat hulls, whole oats, wheat bran, etc. The product should be examined before purchasing.

INATION OF CHOPS.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$ 1.00	92	------	------	------	------	11.75	10.25	6.63	6.99	All corn product.
------	100	------	------	------	------	10.06	3.34	4.68	1.97	Wheat and corn product.
------	100	------	------	------	------	7.62	4.69	12.81	4.20	Some ground corn, but mostly oat hulls—low grade feed.
------	100	------	------	------	------	11.62	5.65	7.65	------	Ground corn and oats.
------	100	------	------	------	------	10.75	9.17	5.20	------	All corn product.
------	100	------	------	------	------	9.50	5.48	3.60	------	Ground corn and whole oats.

Sample 338 was sold for chops, but contained a large per cent of oat hulls and is a very low grade feed. Sample 86 contained wheat bran and corn product. Samples 247 and 360 were ground corn and oats, and are very good feeds.

DISTILLERS' GRAINS.

Distillers' grains are the kiln-dried residue from the manufacture of alcohol, spirits and whiskey from the several cereals. The process of manufacture consists in treating the ground grains with malt, thus converting the starch into

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
312	Distillery Grain	Sent by E. W. Hoffman, Gastonia, N. C.		Aug. 12
313	----do	Sent by Biltmore Farms, Biltmore, N. C.		July 15

DISCUSSION OF RESULTS.

Two samples of distillers' grains were analyzed. One sample, No. 312, contained ground peanut shells and corn, and is a very low grade feed, containing only 6.75 per cent protein and 32.38 per cent of fiber. This feed is a fraud, and cannot be fed profitably at any price.

Sample 313 is distillers' grains and a very good feed when properly fed.

sugar and by the addition of yeast changing the sugar into alcohol, which is distilled. The residue or distillery slop is dried immediately in especially constructed driers and put on the market as cattle feed. It consists chiefly of the hulls, germs and protein of the cereals.

TION OF DISTILLERS' GRAINS.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber	Ash.	
$						6.75	1.98	32.38	2.29	Ground peanut shells and some ground corn. Very low grade.
						30.83	15.10	9.93	1.93	Distillery grains.

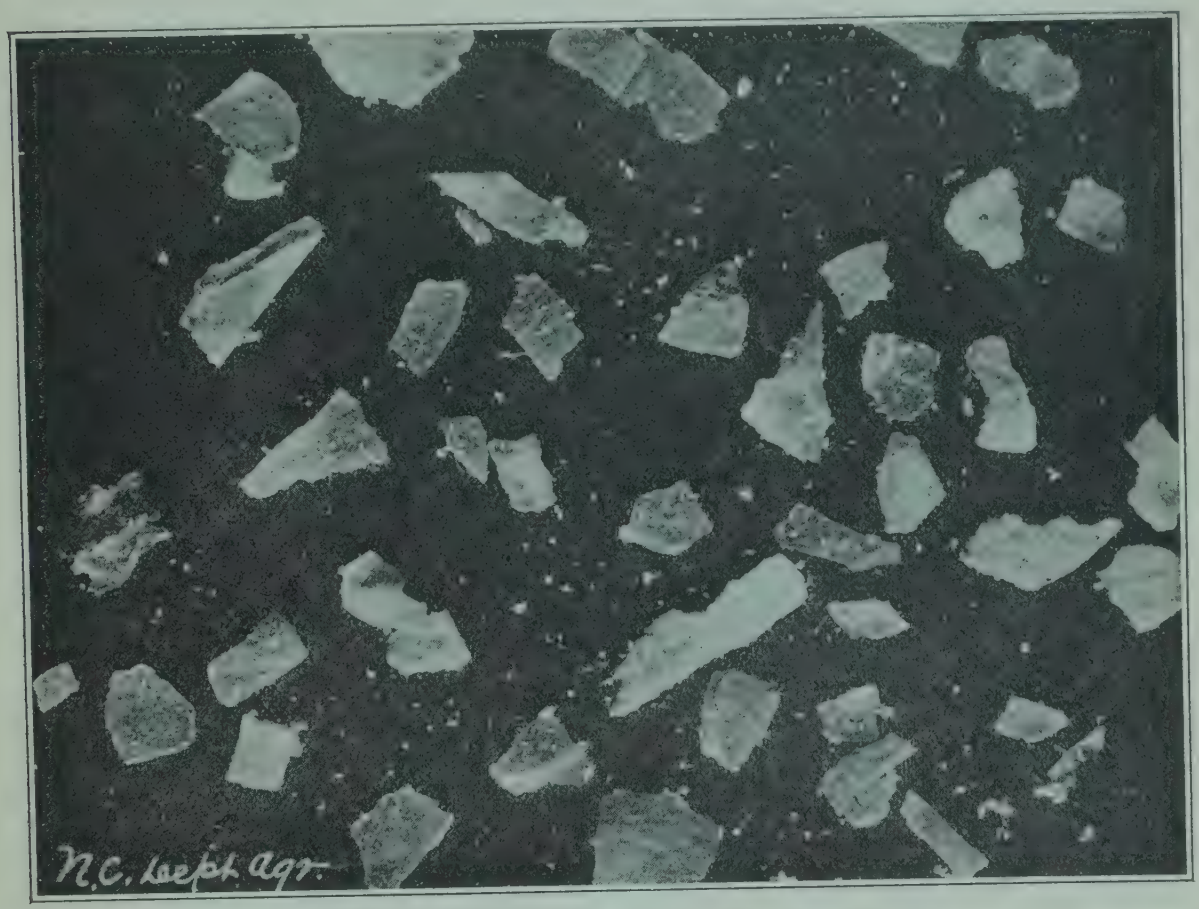

PLATE VIII.

CORN BRAN THAT HAS BEEN MAGNIFIED SEVEN TIMES. WHEAT BRAN WHEN MIXED WITH CORN BRAN IS REDUCED IN FEEDING VALUE IN PROPORTION TO THE AMOUNT OF CORN BRAN ADDED.

HOMINY MEALS OR FEEDS.

The hard part of the corn kernel, known as hominy, or hominy grits, is used for human food. The residue, or soft part of the kernel, sometimes called

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
357	Hominy Corn Meal for Feed.	S. T. Beveridge, Richmond, Va.	Hart & Wooten, Kinston, N. C.	May 10
272	Corn Hominy	Cumberland Mills, Nashville, Tenn.	C. B. Grant, Southern Pines, N. C.	April 29
129	Hominy	J. A. Meadows, New Bern, N. C.	From manufacturer	Mar. 2
117	Hominy Feed	Southern Milling Co., Nashville, Tenn.		

DISCUSSION OF RESULTS.

Four samples of hominy meal or feed were examined and all were composed entirely of corn products and are of very good quality.

Hominy meals or feeds are high in fat content and are good heat and force producers in the animal body.

white meal, is sold as a cattle feed, and consists of the hull, germ and more or less of the protein and starch. It has a feeding value similar to dry corn meal.

OF HOMINY MEALS OR FEEDS.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$						8.72	6.95	5.78		All corn product.
						10.87	8.64	4.74	2.94	do.
1.40	100					8.75	5.10	1.85	1.54	Corn product.
						10.94	9.90	5.30	3.40	All corn product.

PLATE XII.

GROUND CORN COBS THAT HAVE BEEN MAGNIFIED SEVEN TIMES. CORN COBS ARE USED AS AN ADULTERANT IN FEED MIXTURES.

CORN AND COB MEAL.

Frequently corn with the cob which bears it are crushed together, the re-

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
125	Corn and Cob Feed	Granite Roller Mills, Mt. Airy, N. C.	Sampled at mill	
37	Corn and Cob Mixture	Morganton Roller Mills, Morganton, N. C.	----do	
333	Corn and Cob Meal	----do	----do	
302	Corn on Ear and Peanut Bran.	Phœnix Milling Co., Petersburg, Va.	Sent by manufacturers	
299	Crushed Ear Corn, Oats and Bran.	W. S. White, Elizabeth City, N. C.	W. S. White, Elizabeth City, N. C.	May 11

DISCUSSION OF RESULTS.

Five samples of corn and cob feeds were examined. Three samples were ground corn and cob, while one contained besides corn and cob peanut bran. The other sample was a mixture of corn, oats and wheat bran.

LINSEED MEAL.

Flaxseed meal or linseed meal are names given for ground flaxseed from which most of the oil has been removed. There are two processes for extracting the oil from the meal. The first, known as the "old process," and the meal called old process meal, consists in extracting the oil by means of hydraulic

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
331	American Linseed Meal	American Linseed Co, New York, N. Y.	W. S. White, Elizabeth City, N. C.	May 4
335	Linseed Meal		----do	
166	----do		----do	Mar. 4
208	----do	American Linseed Co., New York, N. Y.	J. P. Wyatt & Bro., Raleigh, N C.	Mar. 21

DISCUSSION OF RESULTS.

Four samples of linseed meal have been analyzed and all were found to be pure and up to standard quality.

sulting product being called corn and cob meal. This is a good, satisfactory feed when well ground. It is fed sometimes in place of corn meal and stockmen report favorably on its use.

TION OF CORN AND COB FEED.

Retail Price of Package.	Claimed Weight of Package—lbs	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$						8.75	4.31	7.15	2.10	
						9.06	4.48	6.27	1.82	Ground corn and cob.
						8.12	4.38	4.84		do.
						7.05	2.15	34.78	3.06	Peanut bran with a very small amount of ground corn, low grade.
1.25	100					8.02	4.67	5.46	3.17	Ground corn, oats, wheat bran and chaff.

Sample 302 is a very low grade feed, containing only 7.5 protein and 34.78 per cent fiber. The feeding value of this feed is below that of corn bran. Samples 125, 37 and 33 are up to the average quality of such feeds.

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pressure. The second, the "new process," and the meal called new process meal, consists in extracting the oil by means of a solvent, the one in common use being naphtha. Linseed meal is high in protein and fat and is a very good feed.

TION OF LINSEED MEAL.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$ 1.75	100	32 to 37	5 to 7			32.62	7.60		5.51	Linseed meal.
						32.75	7.49	7.90		do.
						31.25	7.28	8.61	5.43	do.
						31.38	7.96	5.60	5.18	do.

Linseed meal should contain 30 per cent protein and is classed as a feed rich in protein.

COTTON-SEED FEEDS.

If cotton-seed meal contains less than 38.6 per cent protein it is below the standard required by the law on this subject and has had hulls or some other adulterant ground with it. Hulls are found with meal rather extensively and the mixture is no longer sold as genuine cotton-seed meal, but as

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
55	Imperial Stock Feed Meal.	Grant Bros. Co., Memphis, Tenn.	Asheville Grocery Co., Asheville, N. C.	Jan. 18
109	Cotton-seed Feed	Oliver Refining Co., Portsmouth, Va.	Hutcherson Bros., Reidsville, N. C.	Feb. 26
110	----do	----do	J. S. Tullock, Reidsville, N. C.	Feb. 26
19	Cotton-seed Meal Feed	Red Springs Oil and Feed Co., Red Springs, N. C.		
18	----do	----do		
17	----do	Rowland Oil and Feed Co., Rowland, N. C.		Feb. 10
260	Feed Sunny South Brand	Sledge-Wells Co., Memphis, Tenn.		Apr. 23
155	Cotton-seed Hull Feed	Southern Cotton Oil Co., Charlotte, N. C.		Feb. 21

DISCUSSION OF RESULTS.

Eight samples of cotton-seed feeds were examined. Three of these were cotton-seed meal containing finely ground cotton-seed hulls and are high in

cotton-seed meal for cattle, etc. The feeds are valuable in proportion to the amount of meal in the mixture, which is measured by the protein in the analysis.

Cotton-seed feeds must have the guaranteed analysis, consisting of the per cents of protein, fat and crude fiber, on every bag or tag attached thereto, not the per cent of nitrogen or ammonia.

TION OF COTTON-SEED FEED.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$ 1.30	100	------	------	------	------	22.75	5.14	18.30	4.42	Cotton-seed meal, containing finely ground cotton-seed hulls.
------	100	10.00	3.00	30.00	------	7.88	2.72	40.85	2.98	Cotton-seed hulls and meal mixed.
------	100	10.00	3.00	------	------	9.25	3.06	37.58	3.03	do.
------	------	------	------	------	------	6.88	7.35	7.70	6.27	do.
------	------	------	------	------	------	13.92	9.58	8.84	6.31	do.
------	------	------	------	------	------	18.56	3.96	3.83	3.60	do.
------	100	25.00	6.00	------	------	22.10	7.05	25.75	4.49	Cotton-seed meal, containing cotton-seed hulls.
------	100	------	------	------	------	8.00	2.72	38.99	3.00	Cotton-seed hulls and meal mixed.

protein. The other five samples were cotton-seed hulls mixed with a small amount of cotton-seed meal and are low in per cent of protein and accordingly low in feeding value.

MISCELLANEOUS FEEDS.

Under this head are grouped mill feeds, mixed feeds, mill sweepings, screen-

RESULTS OF EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
243	Mill Feed	Archdale Roller Mills, Archdale, N. C.	Kennedy Bros., High Point, N. C.	April 9
235	----do	----do	Sent by manufacturer	April 12
427	----do	Ashboro Roller Mills, Ashboro, N. C.	Neal Clark, Troy, N. C.	Aug. 2
398	----do	John J. Fairbanks (broker), Richmond, Va.	Sent by dealer	April 12
417	----do	Gambill & Davis, Roanoke, Va.	Jackson & Lovell, Mt. Airy, N. C.	July 29
420	----do	High Point Milling Co , High Point, N. C.	J. S. Kinley & Co., High Point, N. C.	Aug. 1
48	----do	J. B. Votspeich, Weaverville, N. C.	Ramsey & Co., Asheville, N C.	Jan. 18
205	----do	Manchester Mills, Manchester, Va.	J. P. Wyatt & Bros., Raleigh, N. C	Mar. 21
69	----do	Marshall Mill Co., Marshall, N. C.	A. Ficker, Hendersonville, N. C.	Jan. 23
68	----do	----do	----do	Jan. 23
426	----do	D. M. McIver, Gulf, N. C.	Sanford Supply Co., Sanford, N. C.	Aug. 1
428	----do	F. McAuley, Mt. Gilead, N. C.	Neal Clark, Troy, N. C.	Aug. 2
441	----do	The Phœnix Milling Co., Petersburg, Va.	Griffin & Parham, Goldsboro, N. C.	Aug. 24
184	----do	Richmond Flour and Feed Co., Richmond, Va.	C. W. Young, Raleigh, N. C.	Mar. 20
229	Feed Meal		H. J. Hood, Selma, N. C.	Mar. 28
401	----do		A. V. Driver, Selma, N. C.	July 13
364	Mill Feed	Roper & Co. (jobbers), Petersburg, Va.	O. S. Joyner, Franklinton, N. C.	May 16
111	----do	J. H. Walker & Co., Reidsville, N. C.	J. S. Tulloch, Reidsville, N. C.	Feb. 26
219	Feed Meal	W. A. Watson & Co., Greensboro, N. C.	J. R. Chrisman, Greensboro, N. C.	Mar. 24
8	Mill Feed	Thomasville Roller Mills, Thomasville, N. C.	J. W. Harris & Co., High Point, N. C.	Jan. 7
246	----do	----do	D C. Moffatt, Thomasville, N. C.	April 9
244	----do	----do	P. H Johnson, High Point, N. C.	April 9
36	Mixed Feed	Acme Milling Co., Talbott, Tenn.	Sent by manufacturers	Jan. 26
82	----do	----do	----do	
10	----do	A. W. Fuller, Fullers, N. C.	O. A. Fouts, Thomasville, N. C.	Jan. 8
95	----do	Granite Roller Mills, Mt Airy, N. C.	Sampled at mill	Feb. 22
183	----do	Gambill & Davis, Roanoke, Va.		
225	----do	Gardner Mill, Hastings, Minn.	John S. McEachern Sons, Wilmington, N. C.	April 4
310	----do	Sent by Z. V. Harrelson, Cherryville, N. C.		July 2
318	----do	Sent by W. C. Jones & Co., Madison, N. C.		Aug. 8
30	----do	J. T. Kennedy, Fairgrove, N. C.	Sent by manufacturers	Feb. 1
11	----do	----do	Thomasville Supply Co., Thomasville, N. C.	Jan. 8

ings, feed meals, etc. An idea of the quality of these feeds is given in the table below.

OF MISCELLANEOUS FEEDS.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$ 1.20	80	------	------	------	------	13.62	3.88	29.73	3.05	Wheat and corn bran mixed.
------	------	------	------	------	------	13.00	2.93	3.36	2.22	Wheat bran and corn product.
1.20	70	------	------	------	------	15.87	4.47	6.26	3.85	All wheat product.
------	------	------	------	------	------	8.50	3.44	10.27	3.69	Ground corn, ground oats and oat hulls—low grade.
1.50	100	------	------	------	------	13.00	------	------	------	Wheat bran, corn bran and chaff.
1.30	80	10.00	3.50	3.00	------	14.00	3.25	9.20	6.82	Corn bran, wheat bran and rice chaff.
1.25	90	------	------	------	------	16.75	3.63	2.80	2.24	
------	------	------	------	------	------	8.75	3.60	6.13	2.05	All corn product.
------	------	------	------	------	------	12.25	2.90	6.23	3.64	Ground wheat, oats and rye.
1.00	.75	------	------	------	------	13.88	3.30	4.92	3.65	All wheat product.
------	100	------	------	------	------	16.87	5.05	6.42	4.55	
1.25	70	------	------	------	------	16.29	4.23	6.33	4.28	
------	------	------	------	------	------	9.25	2.33	39.56	------	Finely ground peanut hulls and a little corn.
------	------	------	------	------	------	8.00	3.21	7.73	2.93	Corn meal, rice chaff and wheat bran—low grade.
------	------	------	------	------	------	7.75	3.25	10.51	2.73	Ground corn bran and rice chaff—low grade.
------	------	------	------	------	------	9.62	3.65	3.00	------	All corn product.
1.50	100	------	------	------	------	14.75	6.25	6.71	------	Finely ground wheat bran, containing some corn product.
1.40	100	12.37	4.11	7.57	------	------	------	------	------	All wheat product.
------	------	------	------	------	------	9.50	3.56	2.06	1.78	All corn product.
1.20	80	------	------	------	------	12.31	4.15	2.81	2.74	Wheat bran and corn bran.
1.35	90	------	------	------	------	13.25	3.23	3.90	------	Wheat product.
------	------	------	------	------	------	12.57	3.24	2.30	2.59	do.
------	------	------	------	------	------	12.81	5.10	5.08	3.06	Oats, corn bran and shorts.
------	------	------	------	------	------	11.62	3.95	3.42	3.50	Ground corn, wheat bran and wheat shorts.
------	------	------	------	------	------	10.38	4.74	2.72	2.77	Wheat bran and corn bran.
------	------	------	------	------	------	11.00	3.33	4.85	2.03	Rye, corn and corn bran.
------	------	------	------	------	------	10.69	3.77	12.07	6.99	Wheat bran, corn bran, ground corn and rye.
------	------	------	------	------	------	17.12	5.88	8.17	6.23	All wheat product.
------	------	------	------	------	------	8.63	3.07	17.79	8.10	Rice chaff and corn and wheat product—low grade.
------	------	------	------	------	------	8.81	4.60	10.51	3.49	Ground corn, ground oats and oat hulls—low grade
------	------	------	------	------	------	11.62	3.57	4.31	2.59	Wheat bran and corn bran mixed.
1.25	90	------	------	------	------	9.69	3.93	2.98	2.82	Wheat and finely ground corn.

RESULTS OF EXAMINATION OF

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Purchase—1904.
421	Mixed Feed	Klutz & Shaver, Salisbury, N. C.	Klutz & Shaver, Salisbury, N. C.	Aug. 2
394	----do	R. E. Lee, Laurinburg, N. C.	R. E. Lee, Laurinburg, N. C.	June 30
27	----do	Mt. City Milling Co., Chattanooga, Tenn.	At Southern Freight Depot, Charlotte, N. C.	Jan. 11
88	----do	Mt. City Milling Co. (Jacksonville Br'ch), Jacksonville, Fla.	Ketner & Setzer, Waynesville, N. C.	Feb. 20
153	----do	Mt. City Milling Co., Chattanooga, Tenn.	Matthews, Weeks & Co., Rocky Mount, N. C.	Mar. 9
130	----do	J. A. Meadows, New Bern, N. C.	J. A. Meadows, New Bern, N. C.	Mar. 3
395	----do	----do	C. B. Hill, New Bern, N. C.	July 6
381	----do	The Patterson Co., Greensboro, N. C.	Coe Bros., Greensboro, N. C.	June 21
185	----do	Richmond Flour and Feed Co., Richmond, Va.	Phillips & Penny, Raleigh, N. C.	Mar. 10
176	----do	Southern Grocery Co., Henderson, N. C.	Southern Grocery Co., Henderson, N. C.	Mar. 17
242	----do	Statesville Oil and Fertilizer Co., Statesville, N. C.	J. P. Harper & Bros., Salisbury, N. C.	Apr. 8
96	----do	Mrs. A. D. Sides, Mt. Airy, N. C.	Sampled at mill	Feb. 26
207	----do	J. P. Wyatt & Bro., Raleigh, N. C.	J. P. Wyatt & Bro., Raleigh, N. C.	Mar. 21
308	----do	Wilson Grocery Co., Wilson, N. C.	Wilson Grocery Co., Wilson, N. C.	----------
410	Bran and Ship Stuff	Augusta Milling and Mercantile Co., Mossy Creek, Va.	F. R. Gray & Bro., Cary, N. C.	Aug. 5
120	Dried Beet Pulp	Alma Sugar Co., Alma, Mich.	Shadeland Dairy and Stock Farm, Wilmington, N. C.	----------
138	Mill Sweepings	Boney & Harper, Wilmington, N. C.	Boney & Harper, Wilmington, N. C.	Mar. 4
119	Soja Beans	Burrus & Gray Co., New Bern, N. C.	Burrus & Gray Co., New Bern, N. C.	Mar. 2
198	Wheat Screenings	----------	Durham Distributing Co., Durham, N. C.	Mar. 18
169	Whole Oats Ground	Elizabeth City Milling Co., Elizabeth City, N. C.	Elizabeth City Milling Co., Elizabeth City, N. C.	----------
124	Cane Seed and Corn Feed	Elkin Roller Mills, Elkin, N. C.	----------	----------
371	Starch Meal	S. G. Fairbanks, Richmond, Va.	J. S. Brown, Oxford, N. C.	May 18
211	Wheat Screenings	Forsyth Roller Mills, Winston, N. C.	Phillips & Penny, Raleigh, N. C.	May 21
123	Wheat, Graham	Granite Roller Mills, Mt. Airy, N. C.	----------	----------
83	Stock Feed	Hayley & Hoskins, Memphis, Tenn.	----------	----------
202	Buckwheat Flour	Hickory Milling Co., Hickory, N. C.	Hickory Milling Co., Hickory, N. C.	----------
141	Whole Oats	W. R. Johnson (broker), Norfolk, Va.	J. W. Isler & Co., Goldsboro, N. C.	----------
14	Meal and Bran	Model Mills, Lexington, N. C.	A. L. Link, Lexington, N. C.	----------
93	Flour	Stuarts Draft Milling Co., Stuarts Draft, Va.	H. Schafer, Mt. Airy, N. C.	Feb. 22

DISCUSSION OF RESULTS.

Sixty-one samples of miscellaneous feeds were examined. Six were low grade, containing less than 9 per cent protein. The remaining samples were

MISCELLANEOUS FEEDS—CONTINUED.

Retail Price of Package.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
$-----	------	------	------	------	------	14.69	4.10	21.22	6.14	Wheat bran, rice chaff and corn bran.
------	------	------	------	------	------	12.81	3.73	4.65	2.35	Whole corn, ground oats and barley.
------	------	12.50	3.50	8.00	------	12.13	3.51	9.45	4.69	Wheat bran, rice chaff and some corn product.
------	100	------	------	------	------	10.00	3.94	8.51	6.47	Wheat bran, corn bran and rice chaff.
------	------	12.50	3.50	8.50	------	13.13	4.68	7.71	5.16	Corn and wheat mixture.
1.25	100	------	------	------	------	9.50	4.35	4.08	1.38	
1.50	100	12.00	1.50	4.50	------	12.25	4.06	4.25	1.20	Corn and oats ground.
1.40	100	------	------	------	------	13.56	2.58	2.03	5.69	Ground corn, rice chaff and some ground rye.
------	------	------	------	------	------	9.75	2.15	13.05	6.82	Large amount of rice chaff, some corn bran and wheat bran finely ground—low grade.
1.50	100	------	------	------	------	17.50	5.08	3.08	4.56	Whole corn and peas ground.
.90	100	------	------	------	------	------	5.37	5.70	3.77	Cotton-seed meal and hulls mixed.
------	------	------	------	------	------	9.50	4.13	2.12	2.23	Ground corn, rye, wheat, peas and buckwheat.
------	------	------	------	------	------	21.88	5.35	13.05	5.74	Wheat bran, ship stuff, cotton-seed meal, linseed meal, ground corn.
------	------	------	------	------	------	12.37	7.63	9.63	7.37	Rice meal and wheat middlings.
------	------	------	------	------	------	17.05	5.59	5.25	5.41	Wheat middlings.
------	100	------	------	------	------	8.58	6.40	16.57	4.85	Beet pulp.
------	------	------	------	------	------	8.38	5.00	1.15	1.30	Sweepings.
------	------	------	------	------	------	35.12	18.60	4.47	4.04	Ground Soja beans.
------	------	------	------	------	------	12.63	3.05	5.70	5.86	Wheat screenings, containing a large amount of chaff and cockle.
------	------	------	------	------	------	12.00	5.53	7.38	3.49	Whole oats ground.
------	------	------	------	------	------	7.81	1.76	1.74	1.75	Cane seed and ground corn.
------	100	------	------	------	------	10.30	9.00	5.37	------	Corn product.
------	------	------	------	------	------	11.75	2.33	3.64	2.61	Wheat product, chaff and cockle.
------	------	------	------	------	------	12.00	2.46	2.56	2.52	All wheat product.
------	------	------	------	------	------	23.62	6.28	19.12	5.63	Cotton-seed meal with some ground hulls.
------	------	------	------	------	------	9.75	2.76	1.15	1.23	All buckwheat.
------	------	------	------	------	------	13.13	5.17	8.86	3.75	Oats.
------	------	------	------	------	------	12.50	3.80	4.00	3.52	Wheat bran and corn meal.
4.50	200	------	------	------	------	10.69	1.64	.30	.82	Flour.

of reasonably good quality. In the above table, under the column marked "Ingredients," will be found the materials of which these feeds were made.

ADULTERANTS.

When mixed with good feeding materials without proper labeling or guarantee to indicate their presence, corn bran, rice chaff, ground corn cobs, peanut hulls, peanut middlings, oat hulls, oat dust, mill sweepings, screenings, cotton-seed hulls and other similar products are adulterants. The tables containing the chemical and microscopic examinations show that these adulterants are being used to a considerable extent in the make-up of the feeds sold for stock in the State. To convey an idea of the real feeding value of these adulterants the following analyses were made:

	Per Cent Protein.	Per Cent Fat.	Per Cent Ash.	Per Cent Fiber.
Peanut hulls	4.56	.81	2.17	67.31
Peanut middlings	8.75	.88	16.75	40.75
Ground corn cobs	3.12	.32	2.19	30.37
Rice chaff	2.50	.31	18.37	34.40
Oat hulls	3.03	1.06	6.70	29.07
Oat dust	8.09	5.01	6.09	1.82
Wheat screenings	9.08	2.02	2.90	3.00
Corn bran	9.00	5.08	1.30	12.70
Cotton-seed hulls	4.75	1.59	3.20	40.54

COTTON-SEED MEAL.

Good grades of cotton-seed meal contain 43 per cent or more of protein. This means that they have about 7 per cent of nitrogen, which is equal to 8.50 per cent of ammonia. Meals in past years especially have not infrequently been considerably higher than this. Eighty-four samples of cotton-seed meal were examined; 67 of these contained as much or more protein as required by the standard of 7.50 per cent ammonia, which equals 38.62 per cent protein. Forty-five of the samples contained more than 40 per cent of protein, and nine more than 43 per cent. Eighteen samples were below the legal standard.

ANALYSES OF COTTON-SEED MEAL.

Laboratory Number.	Name and Address of Manufacturer.	Where Sampled.	Per Cent Ammonia Guaranteed.	Per Cent Ammonia Found.	Per Cent Protein Found.	Remarks.
3071	Battleboro Oil Mill, Battleboro, N. C.	Battleboro			46.25	
3085	----do	----do			45.13	
3130	----do	----do			45.25	
3112	----do	----do		7.64	39.31	
3184	----do	----do	8.00	7.92	40.75	
3074	Clayton Oil Mill, Clayton, N. C.	Clayton		9.23	47.50	
3096	----do	----do		8.37	43.12	
3086	----do	----do		8.06	41.50	
3126	----do	----do		7.52	38.75	
3103	----do	----do		7.50	38.63	
3097	Consumers Cotton Oil Co., Tarboro, N. C.	Williamston	8.00	7.71	39.69	
3117	----do	Hassell	8.00	7.90	40.69	
3119	----do	Edenton	8.00	7.76	39.94	
3174	----do	Washington	8.00	7.73	39.83	
3302	----do	Woodland	8.00	8.02	39.94	
3180	----do	Conway	8.00	7.64	39.31	
3146	----do	Sunbury	8.00	7.56	38.84	
3186	----do	Hobgood	8.00	**7.26**	**37.38**	
3037	Farmers Cotton Oil Co., Wilson, N. C.	Wilson		8.70	44.00	
3073	----do	----do		8.34	42.94	
3098	Havens Oil Mill, Washington, N. C.	Williamston	8.00	8.64	40.50	
3116	----do	Scotland Neck	8.00	8.24	42.44	
3131	----do	Greenville	8.00	8.00	41.19	
3101	----do	Washington		8.34	42.94	
3077	----do	----do		8.29	42.69	
3114	Highland Park Mfg. Co., Rock Hill, S. C.	Charlotte		8.34	42.94	

ANALYSES OF COTTON-SEED MEAL—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Where Sampled.	Per Cent Ammonia Guaranteed.	Per Cent Ammonia Found.	Per Cent Protein Found.	Remarks
3168	N. C. Cotton Oil Co., Raleigh, N. C.	Angier	8.00	7.86	40.50	
3078	Rowland Oil and Fertilizer Co., Rowland, N. C.	Rowland		8.34	42.94	
3141	Southern Cotton Oil Co., Gastonia, N. C.	Dallas	8.00	7.53	38.75	
3084	Springhope Cotton Oil Co., Springhope, N. C.	Springhope		8.36	43.06	
3100	Tar River Oil Co., Tarboro, N. C.	Washington	8.00	8.07	41.56	
3175	----do	----do	8.00	7.88	40.56	
3164	Clayton Oil Mill, Clayton, N. C.	Pittsboro	7.50	7.50	38.62	
3166	----do	Clayton	7.50	**7.34**	37.81	
3187	----do	Stem	7.50	7.20	37.06	
3107	Cotton Oil and Fiber Co., Norfolk, Va.	Edenton	7.50	8.17	42.06	
3165	Dunn Oil Mills, Dunn, N. C.	Clayton	7.50	7.54	38.81	
3171	----do	Benson	7.50	**7.04**	36.25	
3106	Edgecombe Oil Mill, Tarboro, N. C.	----do		7.52	38.75	
3156	Laurinburg Cotton Oil Co., Laurinburg, N. C.	Laurinburg	7.50	8.10	41.69	
3199	Laurinburg Oil Co., Laurinburg, N. C.	Lumberton	7.50	8.12	41.81	
3115	Lenoir Oil and Ice Co., Kinston, N. C.	Scotland Neck	7.50	7.96	41.00	
3129	----do	Ayden	7.50	7.52	38.75	
3093	----do	Kinston		8.34	42.94	
3094	----do	----do		8.34	42.94	
3095	----do	----do		8.17	42.06	
3102	----do	----do		8.00	41.19	
3122	----do	----do		7.76	39.94	
3170	----do	Durham	7.50	7.76	39.94	
3111	Louisburg Cotton Oil Mill, Louisburg, N. C.	Louisburg		7.52	38.75	
3136	----do	Youngville	7.50	8.18	42.13	
3167	----do	McCullers	7.50	7.64	39.31	
3149	N. C. Cotton Oil Co., Charlotte, N. C.	Newells	7.50	8.20	42.25	
3150	----do	Greensboro	7.50	7.64	39.31	
3123	N. C. Cotton Oil Co., Henderson, N. C.	Enfield	7.50	**7.41**	38.12	
3135	----do	Creedmoor	7.50	7.56	38.94	
3183	----do	Henderson	7.50	**7.14**	36.75	
3143	N. C. Cotton Oil Co., Wilmington, N. C.	Warsaw	7.50	7.91	40.75	
3176	----do	Mt. Olive	7.50	7.68	39.56	
3145	----do	John Station	7.50	7.74	39.87	
3154	----do	Aulander	7.50	7.80	40.19	
3128	New Bern Oil and Fertilizer Mills, New Bern, N. C.	Seven Springs	7.50	8.04	41.37	
3120	Oliver Refining Co., Portsmouth, Va.	Edenton	7.50	7.72	39.75	

ANALYSES OF COTTON-SEED MEAL—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Where Sampled.	Per Cent Ammonia Guaranteed.	Per Cent Ammonia Found.	Per Cent Protein Found.	Remarks.
3153	Southern Cotton Oil Co., Charlotte, N. C.	----------	7.50	7.94	40.87	
3301	----do ----------	Lumberton ----	7.50	7.52	38.75	
3132	Southern Cotton Oil Co., Conetoe, N. C. ----	Greenville -----	7.50	7.68	39.56	
3159	----do ----------	Plymouth -----	7.50	7.92	40.75	
3137	Southern Cotton Oil Co., Concord, N. C. ---	Concord -------	7.50	7.54	38.81	
3151	----do ----------	Greensboro ----	7.50	7.82	40.25	
3153	Southern Cotton Oil Co., Fayetteville, N. C.	----------	7.50	7.52	38.75	
3198	----do ----------	Jonesboro -----	7.50	7.80	40.19	
3152	Southern Cotton Oil Co., Gibson, N. C. -----	----------	7.50	8.00	41.19	
3108	Southern Cotton Oil Co., Goldsboro, N. C. --	Goldsboro ------	7.50	7.59	39.06	
3162	----do ----------	Mt. Olive ------	7.50	8.55	44.00	
3177	Southern Cotton Oil Co., Rocky Mount, N. C.	Rocky Mount--	7.50	7.50	38.63	
3124	----do ----------	Whitakers -----	7.50	7.68	39.56	
3099	Southern Cotton Oil Co., Tarboro, N. C. ----	Robersonville--	7.50	7.96	41.00	
3121	----do ----------	Palmyra -------	7.50	7.57	38.94	
3160	----do ----------	Tarboro -------	7.50	7.74	39.87	
3182	----do ----------	Hobgood -------	7.50	7.58	40.00	
3181	----do ----------	Rich Square ---	7.50	7.42	38.18	
3142	Statesville Oil and Fertilizer Co., Statesville, N. C.	Huntersville---	7.50	7.82	40.25	
3169	----do ----------	Mt. Gilead -----	7.50	8.06	41.50	
3118	Virginia-Carolina Chemical Co., Richmond, Va.	Edenton -------	7.50	7.80	40.19	